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GAS JOURNAL

LIGHT ✦ HEAT ✦ POWER ✦ BYE-PRODUCTS

[Founded in 1849 as the "Journal of Gas Lighting."]

VOL. CLXXI. No. 3254.] LONDON, SEPTEMBER 23, 1925. [77TH YEAR. PRICE 1s.

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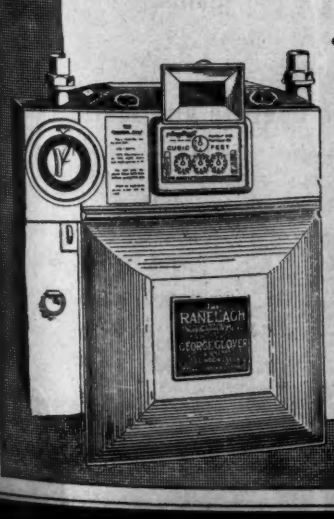

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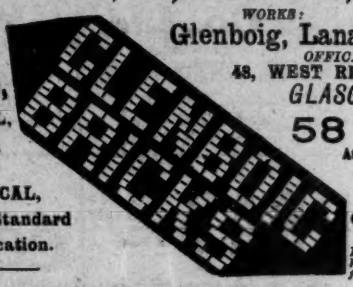

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VOL. CLXXI., No. 3254.] WEDNESDAY, SEPTEMBER 23, 1925. [77TH YEAR.

EDITORIAL NOTES.

Institution of Public Lighting Engineers.

THIS organization has quickly developed into a live and influential body. The second annual meeting was held at Leeds in the first half of the week; and it was a great success from the point of view of attendance, interest, and enjoyment. Leeds is always hospitable to scientific and technical organizations; and it is ever prepared to co-operate in work which promises technical advancement in public service or industry. Thus it was that the young Institution of Public Lighting Engineers did well to accept the invitation to visit the city in which their second President holds high and responsible office in the civic service. The city authorities, as is their wont, aided the Engineer and General Manager of Street Lighting and the Gas Department (Mr. C. S. Shapley) right royally in making the occasion pleasurable and profitable; and the President had, in both the preparations for the meeting and the carrying through of the programme, an enthusiastic worker in the Hon. Secretary (Mr. W. J. Liberty).

One need not to-day dilate upon the importance of having experts in street lighting controlling it scientifically and practically. Through fast-moving traffic and the greater use made of the streets of our cities and towns, risks have enormously increased with time; and, therefore, our public lighting authorities must not forget that they have to provide lighting sufficient not only for convenience, but for the protection of human lives. Thus it is that the lighting of our streets cannot be done in any haphazard manner or on the traditional lines which persisted until a comparatively short time ago. There are numerous factors which must in these times have consideration and application in schemes for street lighting; and only experts can deal with them. We know that the specialists are subject to the decisions of authorities the members of which are not experts in the matter; and partly to this is due the fact that we see such a medley of lighting effects at night-time in our streets. There is educational work to be done among the authorities in order that their qualified officials may be assisted and not impeded in their work. We are not prepared to deny, too, that there is a good deal of work to be done among public lighting officials, in order to gain a better co-ordination of principles, so that the enormous differences which one sees in the lighting of the streets of even neighbouring areas may be wiped-out. The conditions of streets and use do not demand uniform illumination in all areas or even in the streets of the same district; if they did, the work could be at once standardized. But to enable standardization of illumination, circumstances in respect of local characteristics and street use would also have to be standardized. They cannot be. If they could, we should get tired of the monotony of a standardized environment. But what is wanted in public lighting is better uniformity of principles, so that the lighting service in our streets everywhere may become what it should be—conformable with environment and conditions of use. That is what the Institution are endeavouring to bring about, with a view to the economical provision of efficient illumination.

Leeds, ever progressive, has advanced with the times in its public lighting; and the historical account in Mr. Shapley's address of the gradual evolution from old types of street lighting equipment to those which receive modern approval illustrates how the efficiency has advanced. Measured by illumination afforded, the lights of the past were far more expensive than those of the present. Public lighting authorities may be invited to consider what would have been the expense of public lighting to-day if, by flat-flame gas burners and carbon filament electric lamps, the same quantity of illumination had had to be afforded as is now deemed, and is imperatively, necessary. The cost would have been appalling. Of course, most things are dearer now than before the war. But, even so, per unit of illumination, the cost of public lighting is, through the progress in the efficiency of burners and lamps, far less than it was a couple of decades ago. This should be taken into consideration by public lighting authorities when deliberating (if they do such a thing) upon their obligation to revise their ideas of standards of illumination and expenditure to conform with requirement in respect of safety, having regard to the changes there have been in the use of the streets. However, it is seen that, though Mr. Shapley has the public lighting in his care, he is perfectly impartial in the use of gas and electricity for the purpose. He gives in his address a large amount of detailed information as to the present system of lighting and of the work and operations entailed. Incidentally it is interesting to note that both gas-lamp and electric-lamp controllers are used. For the lighting and extinguishing of gas-lamps, there are 3000 pressure-wave controllers all on the three-wave principle, and some 4900 clock controllers. An important point about both these systems is the low amount of labour involved. On the pressure-wave system, one man only is employed to attend to failures; and each lamplighter tends, on the average, 160 lamps, as against 100 hand-lighted. For the clock controllers, only one man is needed for all repairs and adjustments. The President reports satisfactory results from both systems; and it is manifest that they would not have received such imposing adoption had satisfaction not been achieved at an early stage.

On general principles, there is no question that Mr. Shapley is strongly in favour of what he terms bright spot illumination, as compared with level illumination. With spot lighting, he finds pleasing and decorative effects are obtained; and a bright source of light, in his experience, has "a definite and stimulating influence." The President finds monotony (monotony means to him gloominess), through a lack of contrasts, with level illumination, and the method of realizing this is by directional light beams obtained by the use of refractors. It is also patent that the President will not bow down to, or comply with, the laws or fancies of the more advanced exponents of public lighting principles. The intermingling of rather more effect with service, even to the sacrifice of a little illumination for the purpose, he deems an advantage. The basis of best results, dazzle, the height of lamps, and testing are other subjects to which the President devoted attention. The factors which make for good street lighting and the maintenance of the standard are complex; and the complexity is increased by the influence of conditions external to the lighting equipment.

The Street Lighting Problem Rationally Considered.

THE complexity referred to does not want to be increased by the science of street illumination being embellished by the pundits with special technical nomenclature. The notably fine paper which the Distribution Department of the South Metropolitan Gas Company contributed to the proceedings was definitely opposed to illuminating engineering being encumbered with terms which no one would appreciate but those who had studied them; indeed, enough is said in the paper on this score to assure us that, had modesty and courtesy not put a restraint on the writers of the paper, a little more satire might in this connection have been imported into the paper. However, while the main criteria by which there must be determination of the character and efficiency of street lighting are obvious, the auxiliary considerations cause an entanglement, which has never been smoothed out into commonly acceptable principles to a sufficient extent to enable them to be specified. The paper asks, "How is a street-lighting scheme to be specified, and its adequacy or inadequacy be determined? This matter is extremely controversial, and nothing approaching a consensus of opinion has hitherto been achieved on these extremely important matters." In the opinion of the authors, a lighting system is best specified in terms of the curve of radial distribution of the light of the source. All other particulars referring to the illumination provided by the system can then be readily calculated. Practical experience with varied sources, and the character of the illumination they provide, will then afford information useful alike to the contractor and the contracting council or committee requiring their streets to be illuminated. There is reference to the valuable work done by Mr. A. P. Trotter and a Committee of which he was Chairman, just before the war, which furnishes testimony that street lighting carried out to a candle-power specification does provide illumination suitable to the traffic.

In street lighting the gas industry has a load which must be protected; and the paper by the Distribution Department of the South Metropolitan Gas Company will supply much strong argument for all concerned. But it must be remembered that this argument is not based upon an old-fashioned condition of things, or one in which there is lax supervision. The policy in South London is to insure the business by good service. If the public lighting is worth having, then it is worth while doing it well; and in the South Metropolitan district, the acceptance of a contract for street lighting is regarded as an obligation to see that the best possible is done to give satisfaction to the public. It has been recently shown by Mr. Haydn T. Harrison that some 75 p.ct. of the public lamps of the country are supplied by gas. This figure should spur-up the industry to ensure, as far as may be, that nothing is left undone which can be done to prevent any diminution of that percentage. But in this connection Mr. Harrison also made the point that the costs of street lighting are not materially affected by the use of gas or electricity or by both forms. This, however, is not borne out by the facts applying to the municipal districts of South London. In four boroughs where there is mixed gas and electric lighting, the average cost of lighting per mile per annum in 1921-3 was £233; in six boroughs where gas only existed, the average was £132—a difference of £101 per mile. The lighting rate in the former for the half-year ending Sept. 30, 1925, averages 2·03d.; and in the latter, 1·62d. Another excellent point is the effect that gas-lamp modernization has in promoting good service. This is well illustrated by the fact that, whereas in 1899 the streets of South London were illuminated with the equivalent of 280,000 candles, in 1902 the value had increased to 1,270,000 candles, with an addition of only 4 p.ct. to the number of lamps, and a decrease of approximately 20 p.ct. in the total annual consumption of gas in the lamps. By 1913, through commencing the supersession of upright burners by inverted ones, the candle power had increased to 1,700,000. Then war came, and the uncongenial subsequent years; but now the work of change is proceeding, and the aggregate illuminating power will be further enhanced. Experiences from Newcastle-on-Tyne are also quoted in the paper.

The contribution should open the eyes of our electrical friends to what modern forms of gas lighting can really do, and perhaps after they have read, marked, learned, and inwardly digested what is said in it, we shall have no more such nonsense as this from any "authority" on the directional type of reflector: "The effect is a varying "number of images, and thus multiplication varies from "seven to twelve times depending on the dimensions of "the light source, and the increase of candle power varies "from five to eight for the same reason." The authors of the paper correct this piece of absurdity in few words: "A reflector serves to direct the light in desirable direc- "tions only. However many images may be seen in the "mirrors employed for this purpose, the candle power "of the source, including all the images, is unaltered."

This fine and forcible paper should be studied by all gas men; and its perusal will not harm our friends with whom there is competition. They have got somewhat astray lately in their estimates as to the capabilities of gas; and there have been signs of a little inflation of electrical heads due to under-estimates. The paper should also help to keep illuminating engineers who deal with public lighting problems from soaring (as they seem inclined to do) into regions far removed from the practical.

Irish Gas Undertakings and Electricity Supply.

THE Belfast Meeting of the Irish Association of Gas Managers has come and gone; and we are looking to influences and fructification from it which will be of no mean importance to the gas industry of Ireland. The President, Mr. J. D. Smith, M.Inst.C.E., of Belfast, put his whole heart and soul into the meeting with the view of making its issues powerfully good for the whole industry. It was an excellent instance of the strong helping those less fortunately circumstanced. The meeting, too, was accompanied by a magnificent gas exhibition to which the public flocked in large numbers, and which demonstrated that the modern methods of applying gas have made forward strides in sterling worth which have maintained, in respect of economy and efficiency, its place at the head of labour-saving agents in household, shop, factory, and office.

As we pointed out last week in the article dealing with the Presidential Address, what is hoped in Ireland is that this Belfast meeting will be effective in elevating the Association as a power in promoting the interests of the industry throughout the country. The Association wish to be established as the recognized organization of the Irish gas industry, and fully to justify the recognition by work. We hope the ambition will be gratified. There is no reason why it should not be; there is every reason why it should be. The annual report of the Committee, taken in conjunction with the paper by Mr. T. J. Reid, on "Irish Gas-Works Problems," indicates both a response to the revival of the activities of the organization, and initiative in the formulation of industrial policy. The report tells us that there has been an increase in the roll of membership; and we know, from what Mr. Airth told us when he was last in London, that what the Committee are out for in respect of strength is a 100 p.ct. membership from the Irish gas undertakings. And both the Committee in their report and Mr. Reid in his paper made the suggestion that, now that the Free State Government have in hand the development of the Shannon electric power scheme, the non-statutory gas undertakings of the country should put themselves into statutory state as quickly as possible, and then all gas concerns in areas where electricity has not been introduced should apply to be invested with electrical distribution and trading powers. We strongly commend this advice to those to whom it is addressed. It is a policy to be followed up promptly; and a good case for it can be presented on the ground of public economy by having the two services in one set of hands.

In this relation we see that Mr. Reid advanced a new hypothesis in respect of the influence of electricity upon the development of the gas business. It is this, that where electricity does not exist as a distributed commodity, it is as great a deterrent to the use of gas as actual competition. There prevails an inordinate faith in electricity as the best means of compassing requirements; but when electricity is available, then people find that their hopes

are not realized to the extent that they had anticipated or had been led to believe, and thus electricity suffers a set-back in its relationship to the gas business. Of course, one might argue that, this being so, gas undertakings had better keep aloof from engagements to distribute and deal in electricity purchased in bulk. The argument might be sound up to a point; but the facts remain that there are people who will have electricity, and that it is not publicly economical in many districts to have gas and electricity competing against each other through separate concerns, the vitality of which is impaired or destroyed by the efforts of each to produce the starvation of the other. It is a bad public servant that can hardly keep together body and soul. Mr. Reid dealt with several problems which face the Irish gas industry; and in the solution of, or the dealing with, which fully representative and authorized organization can do much. We hope that the ambition for the highest standard of life and usefulness for the organization will be speedily realized.

The Charge and the Industrial Load.

THE submissions in the paper which Dr. E. W. Smith read before the Irish Association, as published last week, were intended for a much larger audience. The contribution was, in short, an appeal to the entire gas industry to investigate thoroughly the whole question of the charges for industrial gas. It is an old subject with Dr. Smith. We have known him argue—when gas friends have been faced with the prospect of a large day industrial consumption if a contract could be entered into at a low price, and have made a *non possumus* excuse—that it is better to obtain (provided there are no distribution disabilities) a good day load through one service-pipe at a small profit upon cost into the holder than lose the business. This gives an insight into his contention, and, perhaps crudely, it indicates the thoughts underlying the main purpose he had in writing the paper. It is a matter which requires thorough investigation, with the view of obtaining proper guidance in relation to it, on the grounds (found stated in separate places in the paper) that the domestic and the industrial loads are totally dissimilar; that the domestic conditions of gas trading cannot, or should not, be applied to the industrial demand; and that, in the economics of gas production, the question as to the use to which gas is put has had too little consideration. We agree. The electric motor and the fuel oil engine force the confirmatory evidence unpleasantly into our faces; and we must not allow the same thing to happen in connection with the heat requirements of industrial furnaces. In fact, it should be a set object of the gas industry not only to go out and increase the industrial heating load, but push steadily forward for a much larger share of the power requirements of the country.

Dr. Smith states that during recent months a demand has been made for a competent committee of experts to be appointed to go fully into the question of differential rates of various orders of consumption; and he sincerely hopes the matter will not be allowed to lie dormant, as there is no doubt the industry is waiting for a lead in the matter. Of course, there are a number of undertakings which already have the power to make differential prices; there are a number which can supply gas in bulk at special rates; there are a number whose statutory powers would have to be altered, so that they can escape from the old tie of a limited discount for large consumption, *plus* a further small discount for prompt payment. It is freedom that is needed; and, having the freedom, a knowledge of how best to apply it in the interests of the concern and the general consumers. Some of those who have the power to make differential prices and to supply at special rates in bulk follow the old traditional lines of a moderation in concession which is less potential and safeguarding than a more liberal policy would be. They cannot or will not read the lessons which another industry presents; they will not tear themselves away from old rules and practices. As Dr. Smith indicates, many gas men do not know the lower limit of price which would pay them for large industrial day loads, and form a security for permanent business. The effect of a cumulation of small profit per therm or per 1000 c.ft. from manufacturers must be important in respect of the charge to the ordinary consumers. With the knowledge he has derived in recent years, Dr. Smith asserts that the deciding factor of any moment, as to whether the gas industry shall be the sole purveyors of energy to industry, is that of price. And in respect of power much the same thing was said by Sir Dugald Clerk at the last meeting of the Institution of Gas Engineers.

As, however, we have pointed out, in addition to expert investigation as to what could be done in this respect of bottom charges to secure the large day loads from industry, there would have to be a fairly extensive overhauling of Private Gas Acts and Special Orders; and Parliament could not stand in the way of necessary modification if industrial and public advantage could be shown. Even the sliding-scale in some cases would have to be revised; but, in respect of the sliding-scale, it has been advocated by some that, in calculating the dividend, the average charge should apply, and not the charge to the ordinary consumer. Parliament, we are pretty confident, would not agree to that; local authorities would, in the event of such a claim, ask for a drastic amendment of standard prices, and then capital might be prejudiced. The right way to look at the matter is that, if—by securing large working-day consumptions at prices bearing low margins of profit per unit on actual manufacturing cost—the total profit from this source enabled the ordinary consumer to obtain gas at a lower price, then that would also redound to the benefit of the stock and share holders under the sliding-scale. (An interesting letter on this subject appeared in the "JOURNAL" for July 15, p. 171.) The question is larger than at first sight appears, and up to the present it has not been properly fathomed to enable maximum progress to be made in the industrial field. That is what is wanted; and we therefore hope the appeal will not pass unheeded. It is the cardinal feature of Dr. Smith's paper, which treated of other matters, also of importance, relating to the development of the industrial applications of gas. It should be mentioned that, in the course of the discussion on the paper, Mr. E. J. Fottrell stated that the National Gas Council have appointed a Committee to consider the question of charges for industrial purposes.

Gas Administrators and Technical Training.

THERE are some things which it is very difficult to drive into universal acceptance in the gas industry, simply because, no matter how important the subject may be, there is some inexplicable resistance to the principle that new times and new conditions necessitate a change not only in our beliefs but in our practices. The resistance does not exist everywhere; but it has active being in many quarters of the industry. This applies to the definitely momentous question of technical training. Technical training for gas men is no new topic; in isolated undertakings a high standard of such training was long since set up, and systematic courses were part of their policy and were insisted upon. But so long as there was no commonly recognized standard of training and certification in the industry, there was a painful looseness as to the methods of training, and the knowledge—theoretical and practical—which accompanied it. Owing to the absence of authorized standards of examination to test knowledge—examination by a competent body such as the Institution of Gas Engineers—there were no means by which administrators of gas undertakings could ascertain the breadth and depth of qualification of the candidates for technical positions in their undertakings; all they had to guide them were the testimonials which a candidate had obtained from the engineer or engineers under whom he had previously been serving. We have seen many of these testimonials—some that have been worth prizing, others with signatures upon them of men whom we would not have trusted to run a 50 million c.ft. per annum works, and expect to obtain the most efficient results of which the plant was capable. Then for the candidates, testimonials (standing alone) have not always had the desired effect. While there were no systematic examinations and certification, there have been cases—sometimes surprising—where men of high qualification have lost appointments, probably solely through the superior form

and character of the testimonials which another man with less real qualification has been able to produce. To some highly-trained men this state of things has been discouraging. But now that there are standards of examination and certification, administrators can—if the certificates obtained by the Institution examinations are made a factor in the consideration of the suitability of candidates for vacant offices—have reliance on the information (combined with testimonials) as to technical fitness; and this will be of advantage to the candidates.

We were struck by some of the opening lines of the paper that Mr. Walter Hole, the Organizing Secretary for the Institution Education Scheme, read before the Irish Association on the subject of technical training in the industry. He said: "There is an impression in some "quarters that this is purely a question for the juniors. "No greater mistake could possibly be made. Whether "considered from the point of view of administration, "management, or staff preparation, it is the concern of "all, as it touches all intimately." Then follow a number of justifying reasons, which have been submitted over and over again both in writing and speech—by Mr. F. W. Goodenough, Mr. Hole, and several others, including the "JOURNAL." Indeed, the facts have been placed before the gas industry on every possible occasion. They have been repeated, have been clothed in new dress, have been emphasized; and all for the purpose of getting them home. Yet indolence, obtuseness, inappreciation, short-sightedness—one or other of these still causes inacceptance in many quarters of the industry of the imperative necessity for a higher standard of technical training, while every engineer and gas administrator should give it his unqualified support in the ways to which reference has frequently been made. "There is an impression in some quarters that this is purely a question for the juniors of the gas industry." We had to rub our eyes to assure ourselves that there had been no misreading of the sentence. But there it is; and Mr. Hole, behind the scenes as he is, knows better than we of the attitude towards the scheme of different men in the industry. Thank goodness the administrators and engineers are not alike in this particular; what is wanted is a likeness in universal and enthusiastic support. Really we cannot understand the posture of those who think this is a matter purely for the juniors. Who is responsible for the gas industry—for its finance, for its manning, for its future? The administrators and the chief executive officers. Let them look round as Mr. Hole bids them do. What will they find? Practical problems in both gas manufacture and supply are growing more complex. Competition is becoming keener. We are increasingly being forced to realize the necessity for using every endeavour to maintain and improve our position. There is a large invested capital to conserve and make as productive as possible. Upon gas administrators are onerous obligations. Is it the concern then of gas administrators and chief executive officers that those who are to bear future responsibility in technical capacity should be as efficient and qualified for their work as it is possible to make them? If the answer is (as it should be, for we see no room for any other) in the affirmative, then technical training and certification in the industry is not purely a question for the junior; it is a question of the gravest importance for those to whom have been entrusted the valuable interests of every gas undertaking. Where the exhortation is necessary, we say, "Wake up!"

In his paper (see *ante*, p. 669) Mr. Hole gave again a clear indication of the comprehensive scope of the technical training scheme in its existing amended form; and it is seen that, in principles and structural parts, it is good. Its aim is to be beneficial not only to the student, but to the gas industry at large. It must, however, be backed by a great co-operative effort throughout the industry. Mr. Hole was invited by the Irish Association to come to them, and explain the scheme for the benefit of the Irish Free State and Northern Ireland. This speaks volumes of the desire on the part of the gas men of that country to provide for the industry well-trained technical staffs and successors to those who now hold the reins of office. We are pleased to note from the appendixes to the paper the number of technical schools in the Free State and Northern Ireland in which subjects ancillary to the study of Gas Engineering are taught. What is now wanted of the gas industry of Ireland, as of England, Wales, and Scotland, is well expressed by Mr. Hole, when he writes: "The administrator must offer "facilities and offer suitable assistance and reward to "earnest and promising students." Nothing should be left undone which can be done to provide for the best talent to guide the industry to the far higher place we believe it is destined to serve, and to assist it to overcome the impediments it will meet from competition which with time will grow in intensity. Our defences through men and method must at least grow at a corresponding rate, and all the better if they can exceed the increased activity and efforts of our trade rivals.

The Thermostat in Oven Cooking.

THERE were many instructive points in the paper on the "Domestic Uses of Gas," which Mr. Arthur Forshaw, M.Sc., read at the meeting of the Irish Gas Association; but the one which interests us more than others is that dealing with economy in the gas-oven—or rather gas economy and temperature efficiency in the oven. What he says in this respect will perhaps help our electrical friends to see that their practice of fixed inputs of electrical energy for oven heating—full on, three-quarters, half, or a quarter—is wrong, and that the input should vary with a view to maintaining uniform the temperature conditions in the oven during the cooking process after the initial stage. Before, however, dealing with this point, there is the one of economy in the initial heating of the gas-oven from cold. This primary heating is often overdone. From one cause or another, the gas is usually then burned at too high a rate, and the time taken in heating-up is often negligently exceeded. A quarter of an hour, twenty minutes, and sometimes longer is occupied in the heating-up; and part of this time the gas is being positively wasted. In the Institution special report on oven-testing, the term is used "normal maximum consumption," which is the consumption that is sufficient to perform the initial stages of the cooking operations. In the paper we find that when a packed oven is set to this normal maximum consumption, it will—the temperature being taken by thermometer in the centre of the oven—heat-up from cold to 400° Fahr. in twelve minutes; an unpacked oven requires slightly more gas to do its work, and therefore will heat-up to the same temperature in ten minutes. The point should be emphasized that this does not mean that 400° Fahr. is the temperature required for the initial stages of cooking; but the rate of heating-up—to 400° in twelve or ten minutes—provides sufficient heat units to perform the initial work in the cooking process.

This distinction between temperature and heat units is a fundamental one; and Mr. Forshaw points out that, when once the food has been put into the oven, there is very little relationship between them. Thus a consumption of gas that is sufficient to maintain a definite temperature in an empty oven will cause only a much lower temperature in a loaded oven, although the heat units given to the oven space are the same. This is simply because the cold foodstuffs absorb heat before their temperature can rise. As the absorption continues, the temperature of the foodstuff rises; and this reacts on that of the oven, which does the same. Consequently during actual cooking, there is no constant temperature in the oven; it is a rising one; and therefore it is not possible to lay down that the temperature for cooking any particular food is so-and-so. Our electrical friends will see how this statement of oven conditions reflects upon their claims to constant oven temperatures by the fixed input of electrical heat units. We are following Mr. Forshaw closely in dealing with this matter, because of the interest there is in the point; and there is no better way of expressing the matter, nor is any comment needed. However, from what has so far been said, the difference is clearly seen between cooking in the ordinary way by setting a constant rate of gas flow at the tap, and cooking aided by a thermostat, which is considerably used in America, and has been lately introduced into this country, for controlling gas-oven temperatures. By its means a

given oven temperature can be maintained throughout the cooking period (during the absorption of heat by the food being cooked) in the gas oven—this in actuality, and not otherwise as is the case by relying on the electric switch only, on the assumption that a fixed input of electrical energy will maintain constant temperature conditions in the oven. The thermostat, then, is an aid not only to economy but to efficient cooking conditions. As the author says, after the initial stages of the cooking (such as sealing the meat) are complete, economy may be promoted by selecting such a rate of heat input, and continuing it for such a time, that the food is raised to the requisite temperature to produce the desired chemical and physical changes without exceeding that temperature. Food so cooked is more nutritious and more easily digested than that which has been allowed to exceed the required temperature. There is a great deal of misconception as to oven and food temperatures. Those quoted for bread and meat are usually well over 400° Fahr.; and some people seem to think that the foods must attain such temperatures, whereas no ordinary foodstuff should ever attain an internal temperature higher than 212° Fahr., while meat, for instance, becomes harder and more indigestible the more its internal temperature exceeds 180° Fahr., at which coagulation of proteins occurs.

We have rescued these points from the extensive paper so that they may have prominence and due consideration; but there is another matter in connection with the oven to which attention should be drawn. Among latter-day means of economizing heat in gas ovens is the utilization to a greater extent by various devices of the heat of the products of combustion in the cooking operations. A new idea has been developed by Messrs. Thomas Glover and W. H. Wayte, which causes the circulation of the products of combustion in the oven, and so promotes more uniform heating throughout the oven space. This not only subscribes to economy, but to good cooking conditions. By its use, cold air cannot be drawn through the cooking space. The unit can be fitted into new ovens in place of the usual linings, or into existing ovens *in situ* at low cost. There should be a good demand for this device for the improvement of ovens, just as there has been, and will continue to be, for the new types of higher efficiency hotplates.

Lest You Forget.

Gas Salesman's Day at Wembley is next Wednesday. The programme of arrangements was published in the issue of the "GAS SALESMAN" for Aug. 26, p. 165.

Deficiencies in Declared Calorific Value.

A correspondent writing with reference to our editorial article on this subject in the last issue of the "JOURNAL," says the matter has no doubt been of great interest to many gas engineers; but there is one point which does not seem to have been brought out with any prominence in any remarks in the Technical Press. In the ordinary testing by an official examiner, a margin is allowed; but in the quarterly record no allowance is made for any individual drop in the calorific value during the quarter. Our correspondent agrees that this is the correct method. It appears to him, however, that there is a peculiar hardship attaching to many of the small companies. The large companies have their gas tested once a day; and ranging downwards in size, their gas is tested weekly, monthly, and it may be less often. It is, therefore, quite conceivable that a small company tested (say) three times during a quarter might, through some unfortunate circumstance beyond control, be deficient in quality on one of these occasions—possibly the last—and there is no opportunity whatever of the manager of that works bringing his average above the declared value; yet it is also conceivable that on every other day of the quarter his gas may have been above the standard. The writer adds that he has no knowledge of the actual number of testings made at the Godalming Gas-Works; but it is a comparatively small works, and he imagines the testings would be few.

The Coal Commission.

The proceedings by the Coal Commission are to be held in public. This is a good thing, as the public will then be able to obtain early information. The Commission have also decided to visit certain of the coalfields so that members may familiarize themselves with present conditions. So far the Commission have held three private meetings, and have resolved to divide the subjects upon which they will require information into the following groups: General Statistics; Demand for British Coal; Utilization of Coal; Obsolescence and Replacement of Mines; Finance and Ownership of Mines; Methods of Working; Marketing and Distribution; Wages and Hours; Accidents and Diseases; Housing, &c.; Joint Committees; Costs other than Wages; Proceeds of the Industry; Research; Royalties; Nationalization of Mines, and Experience in Other Countries. Sir Herbert Samuel and his colleagues are getting to work in a practical manner. They left London on Monday to visit some of the Northern coalfields, in order to get first-hand knowledge of the conditions under which the mines are worked. Until they have familiarized themselves with these, there will be no public sitting.

Hitch between Miners and Owners.

The Miners' Federation have discovered another cause of grievance. It seems that conflicting interpretations are being placed upon the terms of the truce agreement. The miners' leaders allege that, as soon as the truce commenced to operate, the owners began to make reductions in the district basis rates. This action, they say, is imperilling the truce; and a grave and delicate position may arise if there is not satisfaction. The owners declare that there has been no infringement by them of the terms of the settlement. There were interviews with the Mines Department and the Ministry of Labour last week; and the Prime Minister is taking the matter in hand this week.

Electricity in Conflagrations.

Our "Electricity Supply Memoranda" tell of how, during a fire at the noted Brighton Dance Hall which bears the name of Sherry's, two large electric-fans sought to contribute—and did so successfully—to the intensity of the fire by commencing to work, so drawing the flames upwards. Another accident illustrates how electricity can add to the terrors in conflagrations. Sub-officer Sindon, of the London Fire Brigade, died from electric shock last Friday afternoon. He was using a hose at a fire in a Finsbury Street basement when he fell unconscious to the floor. Through a cable being affected by the fire, there was an escape of electricity; and the doors, wet packing cases, and the floor itself, it is said, were giving off electricity. The soaking wet contents of the cellar aided and abetted the distribution of the wayward current; and it is thought that Sub-officer Sindon directed the hose straight on to the source of the escape. He died shortly afterwards in St. Bartholomew's Hospital. Other firemen who went into the basement were, the newspapers state, "blinded and choked by the fumes," and found their task trebly difficult because of the escaping electricity. Assistance had to be sought from the City of London Electricty Supply Company to cut off the current. At the inquest on Sub-officer Sindon, it was shown that actually what occurred was that his helmet came in contact with a live electric wire encased in a tube. A verdict of "Accidental death" was returned; and the London County Council were advised by the jury to insulate firemen's helmets.

Coal, Coke, and Patent Fuel Traffic.

The Railway Unions have under consideration the linking-up with other Unions and the Miners' Federation to form a large labour alliance, to be utilized for exercising force in the case of disputes. It is reported that a delegate conference of the Associated Society of Locomotive Engineers and Firemen have passed a resolution agreeing to the draft constitution of the proposed alliance; and on the occasion the delegates sang "The Red Flag." The whole thing is being engineered by the Communists. When there was the prospect of a strike in the mining industry, the railway men received instructions (which were illegal) not to move, after midnight on the day that the miners' strike was expected to commence, any coal from any place. Had this occurred, they would have illegally

broken their agreements with their employers. The railway men might consider the relation to both the above happenings of the considerable decrease in the railway receipts for the transit of coal, coke, and patent fuel during last half-year. The quantity carried was 97,574,254 tons—a decrease of 9,556,149 tons upon the January to June traffic last year. The receipts for carriage of the quantity of coal, coke, and patent fuel were £17,703,106—a drop of £1,548,907. This is partly due to the fact that countries abroad are satisfying a large portion of their requirements from other sources at lower prices than we can sell at. Why is this? The railway men had better ask themselves, when they see their employment travelling downhill, whether or not it is owing to the lower production of coal per man-shift than before the war, thus resulting in uncompetitive costs of production. They might also consider the facts in the succeeding paragraph.

Coal Mine Losses.

In the quarter ended June, there was a net loss to the collieries of an average of 11¾d. per ton of coal sold. The net costs were 18s. 4⅜d. per ton, compared with 18s. in the March quarter and with 19s. 2d. in the June quarter of 1924. But whereas the proceeds of commercial disposals were 20s. 2¼d. per ton in the June quarter of 1924 and 18s. 6¼d. in the March quarter of 1925, they had fallen to 17s. 5d. during the June quarter. What the miners ignore in making their demands is that it is from this figure that wages must ultimately come. Average earnings per shift—that is, the average earnings of all wage earners of all ages (men, women, and boys of 14), and excluding rent allowances and the value of free or cheap coal—were steady at 10s. 6¾d.; but the output per person per shift was slightly lower at 17·85 cwt. as against 17·98 cwt. It is noticeable that there has been a reduction of practically 8 million in the number of man-shifts worked, and of 1½ million in the "number of man-shifts lost which could have been worked."

FORTHCOMING ENGAGEMENTS.

[*Secretaries of Gas and Kindred Organizations are asked to assist in making this diary of events as complete and useful as possible by sending the earliest intimation of all meetings.*]

Sept. 24.—Wales and Monmouthshire District Institution of Gas Engineers and Managers.—General meeting at Cardiff.
Sept. 25.—Northern Star Lodge.—Meeting at the Midland Hotel, Manchester, at 3.30 p.m.
Oct. 15.—Murdoch Lodge.—Meeting.
Oct. 19-21.—British Commercial Gas Association.—Annual conference and general meeting in Plymouth.
Oct. 28.—Evening Star Lodge.—Meeting.
Oct. 30.—London & Southern District Junior Gas Association.—Meeting at the Westminster Technical Institute.
Nov. 18.—Southern Association of Gas Engineers and Managers.—Meeting at the Hotel Cecil, Strand, W.C. 2, at 2.15 p.m.
Nov. 25.—Evening Star Lodge.—Meeting.

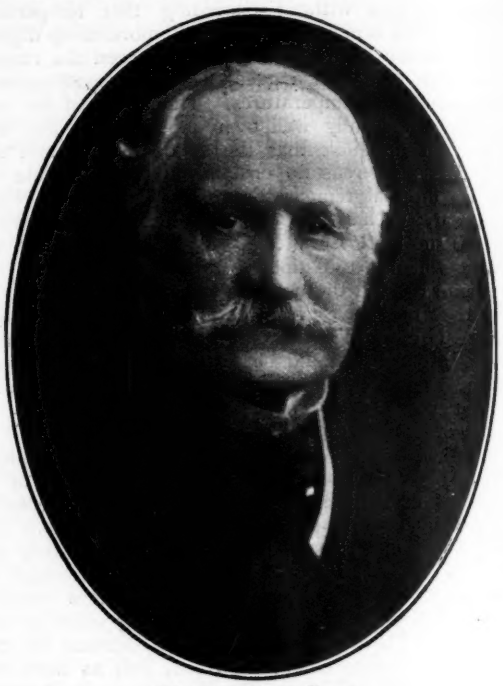
Institution of Gas Engineers.

Oct. 12.—2.30 p.m., Refractories Research Joint Committee.
Oct. 12.—4.15 p.m., Calorimeters Committee.
Oct. 13.—4.0 p.m., Consultative Committee of the Education Scheme, followed by meeting of the Advisory Committee.
Oct. 14.—3.0 p.m., Wrought-Iron Tubing Inquiry Committee.
Oct. 14.—6 p.m., Joint Meeting, at the Institution of Civil Engineers, Great George Street, Westminster, with bodies co-operating in the work of the Special Committee on tabulating the results of heat engine trials.
Oct. 22 (provisional).—2.30 p.m., Emergency Committee. 3.15 p.m., Finance Committee. 3.45 p.m., Council Meeting.
Nov. 10.—4 p.m., Advisory Committee on Education.
Nov. 11.—11.30 a.m., Emergency Committee. 12.15 p.m., Benevolent Fund Committee of Management. 12.45 p.m., Finance Committee.
Nov. 25.—11 a.m., Institution's session at the Public Works, Roads, and Transport Congress.
Dec. 2.—Official visit to the Shipping Engineering and Machinery Exhibition at Olympia.
Dec. 8.—4 p.m., Advisory Committee on Education.
Dec. 9.—11.30 a.m., Emergency Committee. 12.30 p.m., Finance Committee.

PERSONAL.

ALDERMAN SIDNEY FLAVEL.

On Friday, Sept. 11, Alderman Sidney Flavel, Chairman of Messrs. Sidney Flavel & Co., Ltd., Stove and Range Manufacturers, celebrated his jubilee as a member of the Leamington Town Council. Alderman Flavel was a member of the old Local Board before the town was incorporated in 1875, and has been Mayor of Leamington on no fewer than six occasions. It is interesting to recall that to him fell the lot of opening the Town Hall in 1884. He is the only living Freeman of the Borough, with the exception of two young V.C.'s, and the only survivor of the first Bench of Borough Magistrates appointed by the Lord Chancellor in 1876.



Alderman Sidney Flavel.

Mr. Sidney Flavel is the only son of the late Sidney Flavel, of Leamington, manufacturer, and the grandson of William Flavel, the inventor of the "Leamington" range (Flavel's kitchener). After being apprenticed at the Horseley Works, Tipton, he came into the business at the Eagle Foundry in February, 1867; and in 1876 his father took him into partnership. On the death of his father in 1892 he became proprietor, and in 1902, on the incorporation of the firm as a private limited liability company, became Life Chairman. Thus for 58 years he has been associated with the firm of Sidney Flavel & Co., established in the reign of King George III., and maintained in one family for six generations. His son, Mr. Percival Flavel, is Managing Director.

Mr. Christopher T. Parkinson, of Dalton-in-Furness, has been appointed to succeed Mr. J. H. Booth as Gas Engineer to the Poulton-le-Fylde District Council.

OBITUARY.

We have to record the death of Mr. Alexander Rule, Manager of the Dingwall Gas-Works, which took place on Sept. 9. His dead body was discovered in the purifier house by the night watchman. The gasholders were empty, and the contents, it would appear, had escaped at some defect in one of the purifiers. The unfortunate man must have stumbled into the escaping gas before he realized his danger. Mr. Rule, who was a member of the North British Association of Gas Managers, leaves a widow and a young child. He took up the post of Manager of the Dingwall Gas-Works five years ago, prior to which he was at Cowdenbeath. During his tenure of office, he introduced many improvements in the works.

Wales and Monmouthshire Institution of Gas Engineers and Managers.—The general meeting of the Institution will be held to-morrow in the Lecture Theatre of the South Wales Institute of Engineers, Cardiff, at 11 o'clock. At the outset, the chair will be taken by the President, Mr. W. H. Johns. The President-Elect, Mr. H. D. Madden, M.Inst.C.E., will be introduced, and will deliver his presidential address. During the afternoon a visit will be paid to the Grangetown Works of the Cardiff Gas Light and Coke Company.

ELECTRICITY SUPPLY MEMORANDA.

Power from Coal.

It has been reported that Dr. F. J. Wall, of the Sheffield University, has succeeded in devising a new method for deriving power from coal, which will produce more energy per ton than has hitherto been possible. Dr. Wall has been much to the fore lately in the public Press in connection with the insuperable task of "splitting the atom," and in providing a new form of "Death Ray." Now he is endeavouring to raise hopes, particularly among laymen, by the announcement that he has found a combination of thermo-junctions which will provide a commercial form of electric generator. According to the popular Press, the new devices will require "no attention other than stoking with coal to cause them to generate electricity. No steam-boilers or moving machinery would be required, and wear and tear would be almost eliminated." Evidently the electricity papers are highly amused; the daily papers look to the salvation of the country from these thermo-junctions, and the proposed means of generating electricity. It is the hope of Dr. Wall that he may be allowed to demonstrate his discovery before the Coal Commission, because apparently he sincerely believes that his method of generating electricity from coal will cause the latter to yield a much greater heat value than is now achieved. We doubt whether the Coal Commission will have time to go into laboratory experiments of this nature, and consider something which can have no immediate bearing upon the problem which has to be settled within the next nine months. According to one account of the discovery:

> The thermo-junction is said to be capable of developing about 0·05 volt per junction when heated to the requisite temperature, so that (say) 60 such couples connected together in compact form would give a pressure of 3 volts, which could be used to charge accumulators or for obtaining oxygen from the electrolysis of water. Correspondingly higher voltage could, of course, be obtained by increasing the number of junctions. A small-sized generator would take the form of a hollow tube of (say) 1 ft. diameter and about 1 ft. high; a correspondingly larger tube being required for larger outputs. This tube would form the container for a furnace at the bottom of which coal would be burnt and the generated electric current drawn off from two terminals fixed to the generator. A further important result claimed to have been reached is a combination of two metals and a third substance, which gives the very high pressure of about 0·35 volt per junction for a temperature of about 600° C.

How this is going to influence the greater economical use of our coal is not very clear; but "Meteor" of the "Electrical Times," looking at the matter from a practical point of view, shows what a remarkably infinitesimal effect it is likely to have. There is scepticism and sarcasm rolled into one in the following sentence: "As each thermo-junction only develops 0·05 volt direct current, the problem of stepping-up to 33,000-volt alternating current for transmission purposes would seem to present a little difficulty."

Steam Raising by Electricity.

Ever original, the Poplar Borough Council Electricity Department are proposing to anyone who cares for uneconomy to raise steam by the use of electricity—in fact, this is being strongly advocated. The idea is to use coal under boilers at the generating station to raise steam, to apply it in producing electric current at an efficiency of about 12½ p.ct., and then reconvert the electricity into steam. This seems a fearfully round-about way of accomplishing the work. We think—in fact, we know—we could recommend to industrial people in Poplar ways and means of producing their steam requirements by cheaper and more efficient methods. It appears that the North-Eastern Railway have an electrical steam-raising equipment for train heating; and it is stated that this shows an efficiency of 98 p.ct.—that is to say, an efficiency of 98 p.ct. of the efficiency of electricity generation. The actual boiler which has been under trial at the Poplar Electricity Station has, according to the "Electrical Times," a total loading of 25 KW. and a steam output with cold feed of about 70 to 80 lbs. of steam per hour, at (say) 4 lbs. above atmospheric pressure. This, it is stated, is not the limit of the size to which these boilers can be constructed. The North-Eastern Railway equipment "was" 408 KW. loading (1500 volts), and approximately 547 H.P. rating. For small trade purposes, Spencer-Bonecourt, Ltd., have a little boiler on the market working with town gas which has an efficiency of 80 to 85 p.ct. These boilers have been installed for all loads with evaporations up to 1500 lbs. of steam per hour, and for working pressures up to 750 lbs. per square inch. With gas at 9d. per therm, 11,100 B.Th.U. can be purchased for a penny. In some places gas is being sold for industrial purposess at 6d. per therm; and there are instances even lower than this. But at 6d. per therm, 16,666 B.Th.U. can be purchased for a penny. At 80 to 85 p.ct. efficiency, this is a more business-like proposition than a claim of 98 p.ct. efficiency with 3412 B.Th.U. purchasable for a penny. If electricity was sold at fuel cost only, gas would score heavily against it. Says the "Electrical Times:" "Under certain conditions, the case for the electric steam-boiler must be overwhelming." We think this is an error, and that the writer should have said: "Under certain conditions, the case against the electric steam-boiler must be overwhelming."

Glare and Eyesight.

The Electric Lamp Manufacturers' Association are more insistent than electrical engineers as to care being taken to protect the eyesight of users from the glare of lamp filaments. In a lecture which Mr. W. J. Jones, representing the Association, delivered at the Building and Allied Trades Exhibition at Bingley Hall, Birmingham, he confessed that modern electric lighting is badly misused; for in the multitude of cases it is found that antiquated equipment designed for the early carbon lamps of twenty-five years ago is still employed. As he pointed out, glare is detrimental to the eyesight of man, and causes despoliation of work and inefficiency of production. There are many people who imagine that the candlepower of a lamp is the direct index to the amount of light received; but the thing really to be considered is the amount of light delivered at the place where it is required. Mr. Jones was very emphatic that glare is undoubtedly the enemy of good lighting, not only in industrial but in commercial and ordinary life. A bright source of light in the direct line of vision hinders one's ability to see. Plenty of light enables an operator to see more quickly; and it has been found, as the result of tests, that because of this rapid sight an improvement in factory output has been obtained, in addition to which there is obviously less spoilage. The question is of the greatest importance when workers are called upon to exert all their energies to increase production. Good lighting, Mr. Jones said, promotes safety, and increases shop morale; and from the point of view of safety and production, good illumination is an excellent investment.

Electric Fans Intensify a Conflagration.

There are great regrets in Brighton to-day. Sherry's Dance Hall, which is described as "one of the prettiest and daintiest dancing rendezvous on the South Coast," was seriously damaged by fire in the early hours of Sunday morning of last week. The monetary loss is placed at from £8000 to £9000; but it will probably cost, according to the report in the "Sussex Daily News," more than that to restore the building to its former beauty. It was only as recently as last Whitsun that Sherry's was reopened under new ownership, after it had been re-equipped for lighting, redecorated, and refurnished at a cost of something like £5000. It is not alleged that the fire was due to the fusing of an electric wire; our electrical contemporaries will be thankful. Apparently it started in the service kitchen; but what is noticeable is the statement in the report that, when the flames had been forced back some way, the Brigade made the alarming discovery that the large electric suction fan in the centre of the ceiling, 40 ft. up, and the fan in the ventilating-shaft in the service kitchen, had by some means been started; and the flames were being drawn from the seat of the fire up to the ceiling. It was due to this that the flames swept the entire upper part of the dance hall. The silver cascade which formed a novel centrepiece was burnt down, and the electric lamps were destroyed. The report states that the scene is now one of grimy desolation.

Correction.

In the "Memoranda" for Sept. 9, reference was made to a curve which was attributed to the Electric Lamp Manufacturers' Association Lighting Service Bureau. This curve was published by "Electrical Industries" in the report of a paper by Mr. George Stevenson, of the Chloride Electrical Storage Company, Ltd.; and owing to this it was, naturally, considered by us that the curve had appeared in Mr. Stevenson's paper. This was a mistake; it had nothing to do with the contribution.

"Works Schools and their Development."—This was the title of a paper read by Mrs. M. A. Cloudesley Brereton at the annual conference of the Industrial Welfare Association, at Balliol College, Oxford, on Sept. 14. "American and German employers," she said, "are alive to the great importance of adequate supervision and control of their youthful workers, especially between the ages of fourteen and eighteen, and as a whole they are endeavouring by one means or another to provide under modern conditions for the educational needs of the young employees entering their works and business establishments. Surely the employers of Great Britain will do all in their power to help provide a well-directed educational system which, with its discipline and teaching, will help during the critical years of life to equip the younger generation, not only with knowledge, but more especially with that desire to learn and make progress which will provide such an invaluable asset not only to the individuals concerned but to the national life of our country and the world in general."

NATIONAL GAS COUNCIL.

Meeting of the District Executive Board for Ireland.

On Wednesday morning of last week, under the auspices of the Irish Association of Gas Managers, then assembled in Belfast, the annual meeting took place of the District Executive Board for Ireland of the National Gas Council of Great Britain and Ireland. Mr. W. J. Grey, A.C.A., of Dublin, who was to have presided, was unable to be present in consequence of a business engagement elsewhere; and the chair was taken by Mr. J. D. SMITH.

The HON. SECRETARY (Mr. George Airth, of Dundalk) read the minutes of the last meeting and the annual report and accounts, which were adopted.

LIST OF OFFICERS.

The following are the officers for the ensuing year:

Chairman.—Mr. W. J. Grey, Dublin.

Vice-Chairman.—Mr. Richard Healy, Cork.

Secretary.—Mr. G. Airth, Dundalk.

Management Committee.—Messrs. W. J. Grey (Dublin), P. J. Fitzpatrick (Drogheda), G. Airth (Dundalk), R. Bruce Anderson (London), T. Frizelle (Holywood), J. M'Nicholl (Cork), R. Healy (Cork), J. O'Flaherty (Galway), P. J. Rooney (Strabane), H. W. Saville (Wexford), J. D. Smith (Belfast), and B. Mitchell (Bangor).

Representatives on the Central Executive Board.—Messrs R. Bruce Anderson (London), W. J. Grey (Dublin), J. M'Nicholl (Cork), and J. D. Smith (Belfast).

Mr. E. J. FOTTRELL (Joint Manager of the National Gas Council) said that, however efficient an industry might be, unless that industry had as its mouthpiece an official organization, it would not be able to make the headway which it ought to make. The gas industry at the present time was an outstanding example of fine organization. There were two objects really which must be aimed at in an industrial organization such as the National Gas Council—one was a defensive scheme, and the other what might be called constructive. It was not in any sense aggressive. The Council possessed the ability to reach practically unanimous decisions, and to act on them promptly. Immediate action would often prevent harm being done; but in addition they must prepare the ground for future expansion. It had to be remembered that the strength of a chain was its weakest link; and at the moment one of the difficulties they were up against in the organization of the gas industry was the fact that the speed with which they had got their organization together, while they had formed many strong links, had not enabled them entirely to eliminate the weak ones. In the gas industry there were a very large number of small units—in fact, nearly one-half of the undertakings were extremely small—and the trouble they had to contend with was that some of these smaller concerns, by not keeping fully in touch with what was being done by the industry as a whole, were rather apt to commit themselves in some way which might act detrimentally on the industry generally. Mr. Fottrell gave examples of this, and went on to appeal to all present to use what influence they could to induce gas undertakings to join the National Gas Council. They wanted to get every undertaking in, so that they could be absolutely satisfied that the industry spoke with one voice. The cost to the small concerns of joining the Council was negligible; and the organization was essentially a democratic one. Owing to the constitution which had been adopted, they were able to obtain the views of the industry upon any particular point extremely rapidly; and this was of the greatest importance. He suggested that those who belonged to the Council should try to meet more frequently, and give the Council an opportunity of trying to effect some of the alterations and improvements which the members thought should be brought about.

TAR FOR ROADS.

Proceeding with some remarks on the excellent slogan "Use home-produced goods," Mr. Fottrell said they had in England been forced to embark upon a tar propaganda scheme, because of the extent to which imported substitutes were flooding the market. He thought they had begun to show that tar was not a "back number;" but it was going to be a fight to ensure that tar in future at least held its own. The position in Ireland was not perhaps so serious; but he did want to suggest that attention should be paid to the proper preparation of tar for road making purposes, and that as far as was practicable arrangements should be made for those undertakings which were experts in the matter to handle the tar. Any damage done to the reputation of tar in England had been largely due to the unsuitable material sold. In conclusion, he paid warm tribute to the good work by the Secretary, Mr. Airth.

The CHAIRMAN remarked that they were much indebted to Mr. Fottrell for coming and telling them what the National Gas Council were prepared to do for them, if they would only give the Council the opportunity. He did not know that the gas industry in Ireland appealed to the Council on many occasions; but personally he had found their assistance extremely valuable whenever he had been in need of information. Mr. Fottrell had referred to the important subject of tar. It was true that in the north of Ireland some bitumen had been used on the roads; but this, he believed, was due to the policy of the Company who had the refining of tar in their hands before the Belfast Corporation took it over. Since the Corporation had controlled their own tar-works, special efforts had been made to produce a tar suitable for road making; and frequently bitumen had been cut out altogether. The great point was to make the tar suitable; and gas undertakings could do this. Quality must be the first consideration; but if they put the right article on the market, they should have no difficulty in getting the right price.

Mr. J. M'NICHOLL (Cork) was glad this question of tar had been raised. It was a very important one in Ireland, because he found many of the county surveyors had been misled—and he said "misled" advisedly—into the belief that tar was not so good for roads as were other substances. This was chiefly due to the intense propaganda work of the bitumen interests. He thought the National Gas Council were perhaps a little late in taking up the matter; for so far as Ireland was concerned it was only this year that they were getting any effect from the work. Last year the sale was small; but this year he could not make prepared tar fast enough. He was glad to hear the Chairman utter a word of warning as to the quality of tar. In country districts it was no doubt a great temptation to small gas-works to sell crude tar for road making; but it was not at all a suitable material for roads, and sooner or later surveyors would find this out, and the demand for it would cease. Not only that, but all tars would become suspect, and those who made material of the right quality would not be able to market it. It would be a better policy to accept a smaller price from a distiller than to sell crude tar direct to the road authorities. Speaking for himself, he had derived great assistance from the National Gas Council; and he thought small undertakings would receive in proportion even more benefit from the Council than the larger ones.

The SECRETARY also appealed to the members to make more use of the Council. As to tar for roads, about ten years ago he wanted to put down a tar dehydrating plant on his own works; but the make of gas was not sufficient, and so he tried to get five other works to combine with him, on the understanding that his Company should erect the plant, and the others should share the profits in proportion to the quantity of tar sent in. They did not, however, fall in with this scheme, possibly because two of them were corporation gas-works and the Local Government Board forbade them to have anything to do with it. In his own district very little tar was used at the present time; it was nearly all bitumen. But as an example of what the surveyors thought of the slippery tendencies of bitumen, he might say that when two bridges with rather steep gradients had to be covered, they sent to the gas-works for tar, rather than run the risk of breaking the legs of horses.

This concluded the meeting.

Sheffield Illumination Society.

The members of the Sheffield Illumination Society visited the Neepsend Works of the Sheffield Gas Company on Saturday, Sept. 19; the visit being arranged by Mr. Ralph Halkett (General Manager and Secretary of the Company). An interesting and enjoyable time was spent. The party were conducted through the works by Mr. H. Chamberlain (Chief Engineer), Mr. H. H. Collett (Superintendent, Neepsend Works), and Mr. F. J. Jackson. The various processes in the manufacture of gas and the extraction of bye-products were of great interest, as also was a comparison between vertical and horizontal retorts. At the conclusion of the tour, Mr. J. F. Colquhoun (Public Lighting Engineer) thanked Mr. Chamberlain, Mr. Collett, Mr. Jackson, and the Management of the Company for the splendid way the tour had been arranged. Mr. Colquhoun said the visit had been specially interesting to the Lighting Department staff, for—he thought he was right in saying—that Department was the largest consumer of gas in Sheffield.

Association of Special Libraries and Information Bureaux.—A conference is being arranged at Balliol College, Oxford, during the week-end, Sept. 25 to 28, under the auspices of the above Association. Sessions are to be held, dealing with the present position of the special library movement; with informational work in the spheres of politics, business, science, engineering, transport, medicine, and patents; with public and university libraries; and so forth. Among those who hope to be present are the Rt. Hon. Sir Arthur Steel-Maitland, Bart., M.P., Minister of Labour; Prof. Gilbert Murray; M. Paul Otlet (of the Institut International de Bibliographie, Brussels); Brig.-Gen. Magnus Mowat (Secretary of the Institution of Mechanical Engineers); the Master of Balliol; the Rt. Hon. Sir Horace Plunkett; Sir Michael Sadler; Dr. A. W. Pollard; Mr. Percy Alden; and Mr. Thomas Gorrie and Lieut.-Col. J. H. Mitchell, of the Carnegie United Kingdom Trust. A number of Government Departments are sending representatives, as also are learned societies, research associations, the Technical and General Press, public libraries, philanthropic, educational, and other agencies, and the political parties. A special invitation is extended to those engaged in research and in the handling of information. Immediate application should be made to the Organizing Secretary, No. 38, Bloomsbury Square, London, W.C. 1.

IRISH ASSOCIATION OF GAS MANAGERS.

ANNUAL MEETING IN BELFAST.

THE Annual Meeting of the Association was held on Tuesday and Wednesday of last week in the Ulster Hall, Bedford Street, Belfast, under the Presidency of Mr. J. D. SMITH, M.Inst.C.E., J.P., Gas Engineer and Manager to the Belfast Corporation. The attendance was a remarkably good one, and the proceedings were replete with interest. In addition to the business sessions, the members enjoyed the advantage of an excellent exhibition, organized by the Belfast Corporation Gas Committee, which was at the time of the meeting in full swing within the same building. The opening day was marked by well deserved recognition of the unflagging devotion to the interests of the Association over a great number of years of the Hon. Secretary, Mr. George Airth, of Dundalk. It was evident that this presentation afforded as much satisfaction to the members generally as it did to the recipient.

THE PRESIDENT, MR. J. D. SMITH, M.INST.C.E., J.P.

WELCOME TO BELFAST.

Immediately upon the meeting having been called to order, The DEPUTY LORD MAYOR (Sir William Coates) expressed the regret which, he was sure, all felt that the Lord Mayor (Alderman Sir W. G. Turner) himself was not able to be with them that morning. He had, however, gone away for a very well earned holiday; but the Lord Mayor's loss was his (the speaker's) gain, for it had enabled him to come and extend to the Association a hearty welcome to the City of Belfast. It was only right that he should emphasize the fact that a great compliment had been paid to the city by the election as President of the Association of Mr. J. D. Smith, their Gas Engineer. It was a compliment to the city and to Mr. Smith; and—if he might say so—as he had a very high opinion of Mr. Smith, it was a very well deserved honour to him. He was quite satisfied that Mr. Smith would do extraordinarily good work in the position to which the Association had thus appointed him. It was the hope of everyone in Belfast that the visitors would have a pleasant stay, and that their meeting there would prove advantageous from every point of view.

The PRESIDENT, in reply, said that, on behalf of the members of the Association, he desired to tender to Sir William Coates cordial thanks for coming to the meeting, on behalf of the Lord Mayor, and extending to them so hearty a welcome to the city. They appreciated this welcome all the more because it was tendered by a gentleman who had occupied the highest position in the gift of the citizens, and one also who was, for a long time, a member of the Gas Committee, and took a deep interest in the undertaking. They knew the many calls upon Sir William's time on behalf of public service, and how ungrudgingly he had always given his wise counsel and financial ability in the service of the citizens. The gas undertakings all over the country merely existed for the service of the people; and the Association knew that, in their labours during the next two days, they would have the sympathy and support of the members of the Corporation.

PRESIDENTIAL ADDRESS.

The PRESIDENT then proceeded to deliver the address which was published in last week's issue of the "JOURNAL."

Mr. J. M'NICHOLL (Cork) proposed a hearty vote of thanks to the President for his able and instructive address. At the outset Mr. Smith had thanked the members for conferring upon him the honour of electing him President of the Association; but the members also felt that they were honoured by having as their President a gentleman who had filled a similar position in the parent Institution with such conspicuous success. Those of them who had had the privilege of listening to his address in the City Hall, Belfast, two years ago, looked forward with pleasurable anticipation to the present meeting, and they had not been disappointed. The subjects with which he had dealt were all-important ones at the present day, and the address would well repay the further study which it would certainly receive from them all.

Mr. W. E. YOUNG (Queenstown) seconded the vote of thanks, and presented to Mr. Smith the President's medal, expressing the hope that the recipient might enjoy long life and great prosperity.

The PRESIDENT thanked the members for the way in which they had received his address, and for the medal, which he assured them would be highly valued as a memento of an ex-

tremely pleasant occasion. The presentation brought back to his mind the occasion when, some sixteen years ago, he received a similar token from the Irish Gas Managers.

COMMITTEE'S REPORT AND ACCOUNTS.

The HON. SECRETARY (Mr. George Airth, of Dundalk) then read the following report of the Committee:

Your Committee have pleasure in reporting that the meeting in Dublin, held under Mr. W. E. Young as President, was very successful, and that the Association, after its long recess, seems to have taken a new lease of life. They trust that every manager will in future do his best to be present at the meetings; for it is only by interchange of views, and the reading of papers, that we can become intimately acquainted with one another, and share each others successes and disappointments. We are having new names added to our roll, especially of ordinary members, and we hope, with your co-operation, to have every gas manager in Ireland a member by this time next year.

The subscriptions were raised last year from 5s. to 10s. for ordinary members, and from 10s. 6d. to 21s. for extraordinary members; and we trust that these subscriptions will enable us to carry on. The Committee gratefully acknowledge the sum of about £40, which was received for the P. B. Ellacott Fund.

The Committee had an interview with Mr. F. J. Allen, of the Power Section of the Ministry of Industry and Commerce, in Dublin on Sept. 24, 1924. As far as the Free State is concerned, Mr. Allen agreed with the following letter, which was sent out to all non-statutory gas-works in the Free State:—

> "Mr. Allen made it abundantly clear that, until gas concerns became authorized or statutory companies, any application by them or objections to electrical supply powers could only be considered on the same basis as applications or objections from private individuals. If, however, a gas company had obtained statutory powers as such, and the supply of gas had been satisfactorily maintained in its area, preference would be given in the consideration of an application for authority to supply electricity, having regard to the existence of organizations, and also having regard to the fact that the Ministry are not desirous of encouraging such competition as would unreasonably affect capital that has been invested in local gas undertakings.
>
> "Mr. Allen expressed the opinion that, if any fairly large proportion of non-statutory gas companies were to join in an application for a joint Special Order under section 10 of the Gas Regulation Act, 1920, the expense in which each company would be involved should not exceed £10. As the powers of the Electricity Commissioners are now vested in the Minister for Industry and Commerce, the subsequent application for an Electricity Special Order under the Electricity Supply Act, 1919, would not involve the applicant in heavy expense. Under an Electricity Special Order, the party on whom the Order is conferred is allowed two years within which the supply of electricity should be provided, or such extended time as the Minister for Industry and Commerce might approve; and in connection with the fixing of such period, due consideration would be given to the possibility of obtaining, in the near future, a supply in bulk from a national supply station, such as that contemplated under the proposed Shannon scheme.
>
> "The Committee suggest that all non-statutory companies should consider the advisability of applying immediately for statutory powers as gas companies, and also of subsequently making application for authority to supply electricity. The Committee cannot too strongly urge upon every non-statutory gas company that they are now afforded what is probably *the last chance* of securing their rights and privileges at a low cost."

From twelve to fourteen gas companies have taken advantage of these privileges, and, by doing so, will have first chance of being distributors in their areas of supply. The price of a Joint Bill will probably not exceed £15 per company, and your Committee think it would be worth a good deal more than that to receive such security of tenure. If other companies wish to take advantage of this offer, they should immediately get in correspondence with Mr. A. Kirkham, Gas-Works, Enniscorthy, who will give them the necessary information.

The report was adopted, on the proposition of Mr. T. FRIZELLE (Holywood), seconded by Mr. H. W. SAVILLE (Wexford).

Mr. G. W. NORMAN (Dublin) next presented the accounts for the past twelve months—showing a balance in hand of £4 6s. 5d.—and they were adopted, on the motion of Mr. YOUNG, seconded by Mr. A. KIRKHAM (Enniscorthy).

NEW MEMBERS.

Moved by Mr. P. J. FITZPATRICK (Drogheda), seconded by Mr. A. KIRKHAM, the following new members were elected:

Ordinary Members.

Mr. W. Armstrong, Enniscorthy	Mr. F. Edmonds, Waterford
Mr. J. H. Bell, Portrush	Mr. H. M'Elwee, Killarney
Mr. J. L. Hyslop, Belfast	Mr. B. Gibson, Clones
Mr. A. P. Hoskins, Belfast	Mr. P. F. Keating, Trim
Mr. W. Harrison, Belfast	Mr. W. Woods, Donegal
Mr. A. Robin, Holywood	

Extraordinary Members.

Mr. W. H. Ainsworth, Manchester	Mr. L. Fletcher, Glasgow
Col. Glover, C.M.G., D.S.O., London	Mr. S. F. House, Dublin
Mr. J. A. Maclay, Glasgow	Mr. C. Courtney, Dublin
Mr. D. W. Richardson, Liverpool	Mr. F. Maguire, Dublin
	Mr. A. Docking, Belfast
	Mr. H. Saville, Leeds

OFFICERS FOR 1925-26.

Messrs. JAMES WHIMSTER (Glasgow) and L. P. PHILLIPS (Dublin) were appointed Scrutineers; and they subsequently announced the election of the following officers for the year:

President.—Mr. J. O. Halliwell, Mullingar.
Vice-President.—Mr. J. M'Nicholl, Cork.
Members of Committee.—Messrs. B. Mitchell, Bangor; L. W. Dalby, Wicklow; and J. A. Pemberton, Sligo.
Auditor.—Mr. G. W. Norman, Dublin.
Hon. Secretary and Treasurer.—Mr. G. Airth, Dundalk.

AFFILIATION WITH THE PARENT INSTITUTION.

The HON. SECRETARY remarked that at a meeting of the Committee the previous evening it was agreed that it should be proposed at the meeting of the Association that, as theirs was the only organization of the kind who were not affiliated with the Institution of Gas Engineers, they should again become so affiliated with them. The reason why the Association had given up their affiliation with the Institution was that they had not the necessary funds to maintain it. However, it was hoped that now, with a further influx of members, it might be possible to afford the fee which affiliation entailed.

Mr. MATT. DUNN (Newcastle-on-Tyne) said he was very glad to hear this proposal brought forward, and had great pleasure in moving that the Association should be affiliated again with the Institution of Gas Engineers.

Mr. W. H. ROBERTS (Donaghadee) seconded this, and it was unanimously agreed to without further discussion.

TECHNICAL TRAINING WITHIN THE INDUSTRY.

Mr. WALTER HOLE (Organizing Secretary of the Education Scheme of the Institution of Gas Engineers) gave the address on "Technical Training within the Gas Industry," which appeared in our pages last week.

Discussion.

The PRESIDENT, at its conclusion, voiced the gratitude of the members to Mr. Hole for having come so far to address them on this subject. They must all be agreed that proper education of the young men coming into the industry was essential. In the past they had had to secure recruits from all parts and classes, and to make the best of the material at disposal; but the education scheme which had now been put forward would ensure that in the future a man would really have no chance unless he possessed certificates or diplomas in proof of his ability.

Mr. A. S. BROOK (Lisburn) said he had for some years been personally interested in this subject, because he had a son who was in training, and hoped some day to be a gas manager. Living, however, on this side, there was very great difficulty, as compared with England or Scotland, in training anybody for the industry. He had hoped that Mr. Smith would have made it possible for gas manufacturing classes to be conducted at the Belfast Technical School. There were a good many gas-works within 20 miles of the city, and he knew there were a number of juniors who would like to take courses in gas manufacture. Then there was one thing he noticed in connection with the scheme prepared by the Institution of Gas Engineers. A young man without actually being engaged in a gas-works could not get the diploma. A youth might be the son of a gas manager, and practically living on the works, but to be eligible under the scheme he must be actually engaged on a gas-works. Could Mr. Hole hold out any hope of a modification of this stipulation? The education question was a very necessary one to raise in Ireland, where the technical side of distribution particularly had been very much neglected. He did hope that those in authority would see what could be done for the juniors connected with the industry.

Mr. W. H. ROBERTS remarked that he was in very much the same position as the last speaker. He had two sons, and it had always been a matter of great regret to him that they had had no opportunity of studying. He hoped the Association would take the matter up, so as to ensure the provision of the requisite facilities.

Mr. HOLE replied that he could hold out no hope of any modification of the stipulation that candidates for the diploma must have been actually engaged on a gas-works, and he did not think it would be altogether reasonable to desire such modification. Practical experience was essential. The diploma was not merely a certification that a man had passed a certain examination—this was only one-third of it. What the diploma was intended to mean was that the possessor had that intimate knowledge of fundamental and detail works practice that could only come from actual experience. He had been to the trouble of getting from the educational authorities in the North of Ireland and the Free State a list of the technical schools in which technical instruction could be obtained in three at least of the ancillary subjects set out in the scheme. Members would see from the list what facilities were available. When passing through Dublin, he had had an interview with the Assistant Secretary of Education there, and had seen a copy of the regulations governing technical instruction. Really he had been surprised how wonderfully flexible these regulations were; there was nothing like them on the other side. A class might even be formed on a gas-works, under control as to conditions, supervision, qualifications of the teacher, &c. Of course, he could not tell whether similar regulations now applied to the North of Ireland. A class such as he had referred to having been formed, the Government were prepared not only to give it their blessing, but to pay three-fourths of the expenditure. It was up to them all to find out just what it was possible for them to do in their own district. They must not have the feeling that because there were no classes there could not be any.

Mr. Hole was heartily thanked for his address, and in reply he

invited members to communicate with him regarding any points about which they might still be in doubt.

This concluded the morning session, at the close of which the members and friends were entertained by the President at luncheon in the hall.

PRESENTATION TO THE HON. SECRETARY AND MRS. GEORGE AIRTH.

The afternoon's proceedings opened with the presentation to the Hon. Secretary of a handsome canteen of cutlery, and to Mrs. George Airth of a gold wristlet watch.

The PRESIDENT said: We have had in our proceedings up till this time a considerable amount of work or duty; and we now come to an item of a very pleasurable nature. Some time ago I was approached by Mr. Harrison and Mr. Frizelle, in reference to the desirability of making a presentation to our esteemed Secretary, Mr. Airth, and his good wife. I need hardly say that this proposal appealed to me immensely, because I know what a tower of strength Mr. Airth has been to the Irish Association of Gas Managers. The members of the Association took the matter up heartily, and have carried it to a successful conclusion. As to the merits of Mr. Airth, it is not necessary that I should say a single word, as you all know him as well as, or even better than, I do. The Government of this country is carried out by Departments; and we are accustomed to hear a good deal of the politicians who are at the head of (say) the Foreign Office or Home Office. The man, however, who does the Government's work is the Permanent Secretary of the Department, and the man who does the work in the Irish Association is not the President, but the Secretary, Mr. Airth. [Applause.] He is a very able and conscientious worker. The welfare of the Association lies very near his heart, and he has given much of his valuable time and attention to its affairs. What he has done for it may never be fully known; but we want him to realize that we appreciate his efforts on our behalf. I will now read the formal address which has been prepared by the Committee in charge of this presentation:

> We think it is full time, owing to your long, capable, and faithful services to our Association, that we should give expression to our feelings of gratitude and appreciation of the work you have so ably done on our behalf.
>
> As our President in 1905, and our Secretary and Treasurer since 1908, you have allowed no opportunity of furthering our interests to pass, but have at all times, irrespective of personal inconvenience, had a watchful eye to our welfare.
>
> During the general dislocation caused by the great war, when we were unable to meet as an Association, your energy and ability kept our organization alive. But for you, it would have passed into the limbo of things that were but are not. To you we owe its present vigorous life.
>
> In asking you and Mrs. Airth to accept the accompanying tokens of our admiration and respect, we pray that you may both be long spared to your many friends, and that you, dear Mr. Airth, may be in a long future, as you have been in the past, a tower of strength to our Association.

In asking you and Mrs. Airth to accept these presents, I should like you to remember that the intrinsic worth does not represent fully the good wishes of the members. They are given only as a token of their high esteem. We hope that you may be long spared to look after the interests of the Irish Association of Gas Managers, and we wish Mrs. Airth and you long life and every happiness and prosperity.

Mr. AIRTH, returning thanks, said: I thank you most sincerely for the magnificent presentation you have made to me in recognition of my services as Hon. Secretary and Treasurer of our Association for the last 17 years. The kind words you have said about me are very dear to me, though they have been too flattering in their import; but I can assure you they are the standard at which I have always aimed since I first took over office as a stop-gap, and then took on what seems to be a perpetual recreation for at least my summer vacation. It is very hard to find words which would, even in a meagre way, convey my heartfelt appreciation of the honour you have done me. But you will, I feel sure, take the will for the words; and in that spirit I ask you one and all to accept my very best thanks. It may not be out of place, on a momentous occasion such as this, briefly to review my connection with the Irish Association of Gas Managers. I joined the Association on my arrival in Ireland in 1900, was on the Committee in 1902, Vice-President in 1904, and President in 1905. Owing to the indisposition of the late Mr. Whimster in 1907, I assisted then in carrying on the work, which he had created in 1887; and I would like to register my appreciation of the immense amount of work he did, not only for our Association, but for the honour of the profession to which we all belong. Mr. J. G. Tooms officiated as Secretary for him during his period of office in 1904 as President, and during that short period did valiant service. Looking back upon those years, in which my own history has been bound up with the history of the Association, I can truthfully say that my work has always been a pleasure, and that the furtherance of its interests has always been my greatest source of gratification. Taking our present meeting as an indication, I think our Association shows no lack of enthusiasm. That our members are taking a vigorous interest augurs well for a real live organization; but of course it is essential that this interest should be sustained. No association can lead a useful life by annual orations, however eloquent; and no executive committee can accomplish much without a feeling of solidarity behind it. Our annual meetings, and the exchange of views which they entail, are a source of inspiration which help us to surmount individual difficulties in our respective spheres. Some of us may be fighting an economic battle, others may be in perpetual conflict with a stubborn and non-progressive directorate; but no gas manager worthy of the name can, in this age of organization, persist in a policy of isolation. The Association's success in this direction may be gauged from its membership; but I will not rest content until every manager in Ireland is within our ranks. Our efforts have borne fruit in many fields of activity; and we face the future filled with a spirit of stern resolution and self-reliance. On behalf of my wife—she who halves my troubles and doubles my joys—I return you her most sincere thanks for the beautiful gift you have presented to her. It may remind her of some hours she has had to sit lonely by herself; but I am sure the hours spent that way were not grudged to the Association. Once more I thank you from the bottom of my heart for your kindness and consideration at all times to my shortcomings, and particularly for the manner in which you have signalized this occasion. Your splendid gift will always serve as a reminder of the happiest labour of my life, of the harmony that has characterized all our dealings with each other, and especially of the generosity which has prompted the presentation.

Mrs. AIRTH also returned thanks in well-chosen words.

GAS CHARGES AND INDUSTRIAL GAS.

Dr. E. W. SMITH (London) followed with the address on "Gas Charges and Industrial Gas," which was given in last week's "JOURNAL."

Discussion.

The PRESIDENT said he thought they had only to wait for a revival of trade in order to witness very great strides in gas consumption for industrial purposes. It was up to all gas undertakings to put themselves in a position to meet that demand when it should come along. In Belfast they were doing, and would certainly do, everything in their power to further the use of gas in the shipyards and industrial works.

Mr. W. E. YOUNG (Queenstown), referring to differential prices, remarked that, of course, most gas companies did give some concession to users of gas for industrial purposes; but in a small place this often aroused suspicion of the gas company. He himself had been asked why, if he could sell gas at a certain price to one consumer, he could not do so to another. It was generally conceded that differential prices were advantageous in promoting industrial

VISITING THE WORKS.

consumption; but there was the difficulty to which he had just made reference.

Mr. E. J. FOTTRELL (London) pointed out that this matter had been for some little time under consideration by the National Gas Council, and a Committee had been appointed who had already held one meeting. Dr. Smith had referred to some of the difficulties underlying the making of a differential rate. It was common knowledge that in America such rates had been going ahead rapidly; but unfortunately in this country there had not been the same stimulus, owing to limits imposed by legislation. The primary restriction was that not more than 15 p.ct. reduction could be given to any particular consumer. Within the limits of this 15 p.ct. undertakings could offer what differential rates they pleased, provided that the charges were always the same in similar circumstances to every consumer. He suggested that for many industrial purposes a maximum concession of 15 p.ct. was quite inadequate. In the second place, they had been up against the difficulty to which Mr. Young had referred—namely, that it was very often thought that a large reduction to an industrial consumer was throwing a burden upon the domestic—and particularly the slot—consumer which he ought not to be called upon to bear. It should be a comparatively simple matter to show that, if an industrial consumer or consumers were not induced to take a large quantity of gas at a low price, the domestic consumers would have to pay a very considerable addition to the price they already paid, and would be no better off. The main points that Dr. Smith had emphasized were, he believed, being closely looked into by the Committee he had already referred to.

Dr. SMITH, having been accorded a vote of thanks, said he hoped each of them in connection with his own undertaking would make every effort to secure an industrial load. They must make use of all the information that was available—he did not mean in the Press, but individually.

WATER SOFTENING.

The next business was a paper on "The Permutit Process of Softening Water for Use in Waste-Heat Boilers," by Captain E. BROOKE-PIKE, F.C.S., of United Water Softeners, Ltd. An abstract was given on p. 674 of last week's "JOURNAL."

Discussion.

The PRESIDENT remarked that they had a plant on this process at Belfast, but it had only been working a short time. As, however, some of his junior engineers were present at the meeting, he would be glad if they would tell the members something about its operation. There was also with them Mr. Hunter, an engineer who had had great experience of water softening, and he would first ask him to address the meeting.

Mr. JAMES HUNTER (Belfast) stated that his experience of water softening had extended over twenty years. He had been the means of introducing the first lime-soda system into Belfast; and he extended it practically speaking into all the different spinning mills in the city and round about. Later, however, a number of firms found the advantage would be greater of getting a water by the "Permutit" process with 0° of hardness. With lime-soda one could not get down to a very low degree of hardness. Speaking generally, they had found the results of changing-over from the lime-soda process most satisfactory. Up to the present time he had installed plants up to about 50,000 gallons an hour. He could safely say from his experience that the "Permutit" system was the one which could be recommended as the best. Cleanliness was an extremely important point, and in this respect the system possessed great advantages.

Mr. J. L. HYSLOP (Belfast) said that although he could not speak with an extensive experience of this particular type of water-softening plant, the results which they were obtaining under working conditions in Belfast might be of interest. The plant was used to soften the water for a battery of waste-heat boilers on the vertical retort installation; and its normal capacity was 1500 gallons per hour, though at present the average demand on it was about 700 gallons an hour. The water used was the overflow water from the water-cooled condensers, and reached the plant at a temperature of about 110° Fahr. It was of about 6·12 English degrees of hardness. It was pumped through the plant at a pressure of 30 lbs. per sq. in.; and in these circumstances they found that the plant would run for about 36 hours without attention, and would soften from 24,000 to 26,000 gallons before regeneration was required. Regeneration was carried out in fifteen minutes—five minutes for injecting the salt solution, and ten minutes for washing down; the latter operation requiring from 300 to 350 gallons of water. The amount of salt used was 50 lbs. per regeneration, which worked out at 2 lbs. per 1000 gallons. No extra labour was necessary, the tests being taken periodically by the boiler attendant; and he might say that, after being once shown the method of operation, the boiler attendants had no difficulty in carrying out the regeneration themselves. Several of their waste-heat boilers had been working continuously for two years; and as some of the water tubes were not easily accessible, they had not been cleaned during this period, so that there was now a heavy deposit of scale of a very hard nature, which was difficult to break, even with a hammer and chisel. On commencing to use the soft water, the effect was at once noticeable, as the boiler gauge glasses, which previously it had been found impossible to keep clean, immediately cleared-up. After working for a fortnight with the soft water, a boiler was opened for inspection; and it was found that the hard scale on the tube plate had been loosened and broken up, so that it was easily removed; and the heavy scale on the tubes themselves was disappearing. Therefore it seemed that, within a short time, the soft water would have the effect of removing the scale; and if so they would be saved the trouble and expense of dismantling the boilers for cleaning.

Mr. J. M'NICHOLL (Cork) remarked that some twenty years ago he had had to work the old lime-soda process, and he could see that the system just described must have very great advantages over it. Reference had been made by the author to the effect of softened water on gun-metal fittings. Had the water any effect on the gun-metal fittings of a boiler? He was dealing with water which was of not more than 2° or 3° hardness; and without any softening he could work Lancashire boilers over twelve months.

Mr. A. P. HOSKINS (Belfast) complimented the author upon the lucid way in which he had placed his subject before the meeting. A point to be borne in mind was that in the case of all other processes one got a sludge; whereas with the "Permutit" system no sludge whatever resulted. A great many efforts had been made to produce an artificial "Permutit," some of which worked fairly satisfactory; but he believed that, in comparison with natural zeolites, the artificial substance always suffered from certain disadvantages. There was a good deal of naturally formed zeolites in the North of Ireland.

Mr. D. OSBORNE asked the cost per 1000 gallons of softening well water of 16° hardness.

Captain PIKE, replying to the questions raised, stated that if the water which was softened had been particularly hard, he thought there might be some effect on the gun-metal fittings of a boiler; but in the case of a water which had contained originally not more than 6° to 10° hardness, he would not anticipate that softening by the "Permutit" process would have any such effect. When using what had originally been very hard water, it would be advisable to change the gun-metal fittings for steel. They were going into the question of obtaining "Permutit" locally; and he hoped they would develop this considerably, because it was very much better to get it here than to procure it from America. There was no loss whatever, except mechanically, in using "Permutit" as now supplied, and its life should be indefinite. Mechanically there was a trifling loss, which in course of time had to be made good by adding a small further quantity. It was very difficult to say off-hand how much the softening of 1000 gallons of water would cost. The initial cost of a plant depended upon the amount of water to be softened, and the hardness of the water. A plant which would soften 1000 gallons of water of 15° would only soften 500 gallons at 30°. After the provision of the initial plant, the sole cost was in respect of salt; and the salt required per 1000 gallons varied as the hardness of the water treated. If one figured at about 0·5 lb. to 0·6 lb. of salt per 1000 gallons, it should give something like an idea of the amount; and the cost of the salt should be somewhere in the neighbourhood of ¼d. to ½d. per pound.

The PRESIDENT, proposing a vote of thanks to the author, informed the members that the plant at the Belfast Gas-Works would be available for inspection during the visit the following afternoon.

DINNER WITH THE GAS COMMITTEE.

In the evening, on the invitation of the Chairman and members of the Belfast Corporation Gas Committee, members of the Association and their lady friends, to the total number of about 110, sat down to dinner in Thompson's Restaurant, Donegal Place; and here a thoroughly enjoyable evening was spent, to which an excellent musical programme largely contributed. In the unavoidable absence, owing to ill-health, of Mr. F. Workman, D.L. (the Chairman of the Committee), Mr. M'Laurin (the Vice-Chairman) presided; and he was supported by Councillors Stewart, Adgey, M'Keag, Hodgen, and Hall, and Mr. J. D. Smith, as President of the Association. The "Loyal Toast" having been honoured,

The CHAIRMAN submitted "The Irish Association of Gas Managers;" remarking that, from what he knew of the gas industry, he thought he could say they were the most important body of men in Ireland, because they worked for the good of the community at large, in providing them with light and heat and other comforts of life. The Gas Committee were very glad that such a successful meeting of the Association was being held in Belfast. It could not be otherwise than successful with their good friend Mr. Smith as President. [Applause.] They in Belfast took some pride in their gas undertaking, because they ranked second in all the United Kingdom in the matter of cheap gas.

The PRESIDENT, who responded, voiced the members' appreciation of the kind words that had been used by the Chairman in proposing the toast. It was the purpose of the Association to benefit all by the experience of the individual, and also to instruct the members in improved methods of manufacture which might be devised, so that the industry and public might benefit thereby. In the existing depressed condition of the industries of the country, it was more important than ever that gas should be produced cheaply, and that an ample supply should be available at all times to meet the needs of the citizens and manufacturers for light, heat, and power. At the present time more and more attention was being devoted to the solution of the smoke problem. The air of the large cities was being polluted by volumes of smoke poured out by manufacturing establishments and by domestic chimneys. It was admitted to-day that the smoke nuisance—particularly in the largely populated areas—was a danger to the public health. If they could show the public the way to a pure atmosphere, and healthier conditions generally, the gas industry would go a long way to justify its activities. It was not an idle boast when they said that gas was unequalled in the service it rendered to the business community and in the homes of the people.

The CHAIRMAN next submitted "Kindred Associations," including the National Gas Council, the British Commercial Gas Association, and the Society of British Gas Industries. It would, he said, be difficult to speak too highly of the valuable work already done for the gas industry by the last three Societies named. Progress had been rapid in the last fifty years in engineering, science, chemistry, and gas engineering, and as time went on the advance was likely to be still more rapid. The National Gas Council had been of great assistance to the industry by the help it had given in legislative matters, and in looking after the interests of gas undertakings. Vigilance was essential in all that related to parliamentary affairs, as it was important that anything brought up in Parliament touching the industry should be closely examined, and wise decisions reached. In this connection the National Gas Council had proved its worth, as all legislation of this sort had been carefully scrutinized, and, if necessary, representations made to the proper authority. The British Commercial Gas Association had ever been to the front in propaganda work; and it was a matter for wonder now how the industry managed to get along before the Association was started. The assistance given in the

preparation of pamphlets, and by advertisements in the public Press, had been a great factor in educating the public in the manifold uses of gas. The Society of British Gas Industries had been instrumental in grouping very effectively the interests of contractors and manufacturers of gas plant, and had always worked in the best interests of the industry.

Mr. E. J. FOTTRELL, replying for the National Gas Council, ventured the opinion that in that assembly the Council was not represented to the extent that it might be. In other words, it did not at present take the part in Irish gas affairs which it was both willing and competent to take. But if he had had any doubts as to what the future of the National Gas Council in Ireland was to be, these doubts would have been dispelled when he saw the splendid assembly they had had that day. The Council in its short life had achieved really remarkable results; and what it had done for undertakings particularly on the other side of the channel, it could do for Irish works, if only Ireland would whole-heartedly support it, and put it to the test.

Mr. W. M. MASON made acknowledgment on behalf of the British Commercial Gas Association and the Society of British Gas Industries. In regard to the former body, he pointed out that there was much room for improvement in the percentage of the gas industry belonging to it in Ireland. As to the "S.B.G.I.," he emphasized the good work—quite as important as that of the gas engineer or administrator—done on behalf of the gas industry by the plant and appliance manufacturers, who spent money without stint on research and on providing the needful facilities for turning out goods that would best meet the requirements of the gas undertakings. What, he asked, would the gas engineer do without the aid of the manufacturer?

The toast of "The Ladies" was next proposed by Councillor GEORGE STEWART, and replied to by Mr. MASON.

"The Belfast Corporation Gas Committee" was honoured at the call of the PRESIDENT, who voiced the opinion of all present in saying that the Association were under a debt of gratitude to the members of the Gas Committee for their generosity in thus entertaining them. The City of Belfast was fortunate in having such an able body of men on the Gas Committee, and to them was due in no small measure the success of the undertaking. The Chairman (Councillor Workman) was unfortunately not able to be with them owing to ill-health; but he would have been there had it been within his power. There was, however, a capable substitute with them, in the person of Councillor M'Laurin (the Vice-Chairman of the Committee). Councillor M'Laurin had conducted the affairs of the Gas Department in a very able way, and had never spared himself any trouble in doing all that was possible to promote its welfare. He had given freely of his time and ability for the good of the community, and no good cause had ever appealed to him in vain.

The CHAIRMAN, in response, said the Belfast Gas-Works continued to make great progress, because in their friend Mr. Smith they had a man who was second to none in the whole of the British Isles. Therefore the duties of the Gas Committee were more a pleasure than a task.

The artists were enthusiastically thanked for their contribution.

After the meeting on Wednesday morning of the District Executive Board for Ireland of the National Gas Council (reported on another page), the proceedings of the Association meeting were resumed.

THE BRITISH COMMERCIAL GAS ASSOCIATION.

Mr. W. M. MASON (the Manager of the "B.C.G.A."), in a speech interlarded with humour, told of the policy and work of the Association—how its remarkable growth in influence and wise salesmanship on behalf of gas had resulted in its securing the goodwill and financial backing of over 92 p.ct. of the industry, including practically all municipal and company undertakings of importance. He spoke of the benefits to be derived from membership, and the value of publicity. Cheap gas was a splendid asset; but even cheap gas would not sell itself. For instance, Bath, in England, and Belfast, in Ireland, where the cheapest gas was sold, did not depend on price only, but looked more and more to good salesmanship. Every undertaking benefited by the national propaganda, and it was surely not too much to claim financial support from all. The papers and periodicals in which the "B.C.G.A." regularly advertised circulated all over Ireland, as well as on the other side; and a recent inquiry from an engineer in the South of Ireland, who stated that he was in charge of the largest firm in the country dealing with enamelling and case-hardening, was indicative of the fact that the advertisements induced business. Industrial uses of gas, referred to by previous speakers at the meeting, were stimulated by publicity. The Association publication, "A Thousand-and-One Uses for Gas," was a recognized medium to this end. Considerable business in the printing and shipbuilding industries, for instance, had come directly from the proper handling of inquiries resulting from "B.C.G.A." advertisements. Irish problems were very much like those in England and Scotland, and were being earnestly tackled by those in leadership who deserved united and whole-hearted support.

Mr. Mason also spoke of the serious menace to the gas industry caused by the suggested Government subsidizing of their principal competitor. He quoted the following resolution to be submitted to the annual conference of the National Council of Women of Great Britain, as showing the need for educating public opinion: "That this Council urge on the Government the importance of developing without delay a comprehensive electrical scheme for the whole country, providing power stations which, while eliminating waste, will stimulate industry, afford domestic light and heat for towns and villages, and abate the smoke nuisance, thus adding to the efficiency and health of the nation." The National Gas Council and the "B.C.G.A." were doing everything in their power to let the "powers that be" and the public know the facts in relation to this matter. It was to the interest of every gas undertaking in the country to waken up to the situation and do everything possible to prevent the foundations of the industry being undermined, and to support financially the schemes that were being developed to safeguard the interests of all. One was too apt to think in round figures rather than percentages. The total amount contributed for advertising gas and its manifold services was almost negligible when shown as a percentage of the capital at stake, or the yearly turnover of the industry.

THE BELFAST GAS EXHIBITION.

The PRESIDENT said he wanted to compliment Mr. Mason upon what his Association had done for Belfast. The smoke abatement exhibit in that hall was the product of the "B.C.G.A." They would be surprised when he told them that, though the gas exhibition there had only been open for seven days, during this period over 45,000 people had visited it. Just imagine for a moment what this meant to a city like Belfast. Over the past three years he did not think there had been a single week without an increase in the gas output; but still he regarded such an exhibition as necessary. They must show the public what they were prepared to do for them and the service they were prepared to give them. Money spent in this way would all come back in the shape of increased business. Advertising was necessary, and properly carried out was bound to be profitable.

DOMESTIC USE OF COAL GAS.

Mr. A. FORSHAW, M.Sc., read a paper on "The Domestic Use of Coal Gas," which, with the discussion, will be found on p. 736.

IRISH GAS-WORKS PROBLEMS.

The final paper of the meeting was one by Mr. T. J. REID, of Ballina, on the subject of "Irish Gas-Works Problems;" and this is reproduced, with the discussion, on p. 740.

AT THE GAS-WORKS.

The morning's session concluded what on all sides was agreed to have been a successful as well as an unusually largely attended meeting—a feature which the President exhorted the members to maintain on future occasions. The afternoon was devoted to inspections of the gas-works and of the gas exhibition in the Ulster Hall.

At the gas-works the visitors had an opportunity of seeing, under the guidance of the President and his assistants, the plant which was fully described two years ago, on the occasion of the visit to Belfast of the Institution of Gas Engineers, as well as some new work in progress. A photograph was taken, with the big spiral-guided holder as a background; and before leaving the visitors were entertained at tea. All were gratified that Councillor M'Laurin (the Vice-Chairman of the Gas Committee) should again be present to join in welcoming them.

TOWN GAS FOR INDUSTRIAL PURPOSES.

The same evening many members of the Association and a number of local industrialists assembled in the Ulster Hall to hear Dr. E. W. Smith lecture on "Town Gas for Industrial Purposes." Mr. M'Laurin presided, and the audience followed attentively the lecturer's points respecting the advantages of gas with regard particularly to the industries which are mainly represented in Belfast. An excellent series of lantern views added to the interest of the lecture, in the course of which Dr. Smith pointed out that to-day is the day of the specialist, and that to secure proper results on a works it is necessary to engage a fuel engineer or a fuel chemist who possesses the requisite qualifications for securing efficient and economical results. However good a plant may be installed, there must be in charge of it someone who understands it.

THE EXCURSION.

Thursday was devoted to an excursion—in which a party of about 80 joined—to Portrush and the Giant's Causeway. Luncheon was taken in Kane's Causeway Hotel, where the weather conditions induced the larger number to spend the afternoon. General regret was expressed that it should have rained on this particular day of the meeting, though it is difficult to understand how more enjoyment could have been crammed into one day than was secured by those who took part in the excursion.

Eventually members parted with deep feelings of gratitude to their President and of satisfaction with the increased vitality of the Association.

Photographic Handbook and Diary.—The use of photography in gas-works construction is becoming more widely valued. Photographs of retort settings, for example, often provide important information. Consequently a handbook which has been published by Messrs. Burroughs Wellcome & Co., containing a wealth of detail on developing, intensification, printing, toning, exposure, &c., will be of interest and benefit to gas engineers and students who have discovered how photography can aid them in their work.

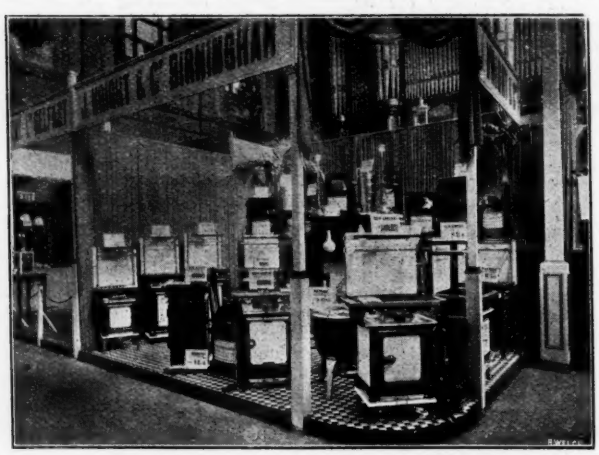
BELFAST GAS EXHIBITION.

A GREAT SUCCESS.

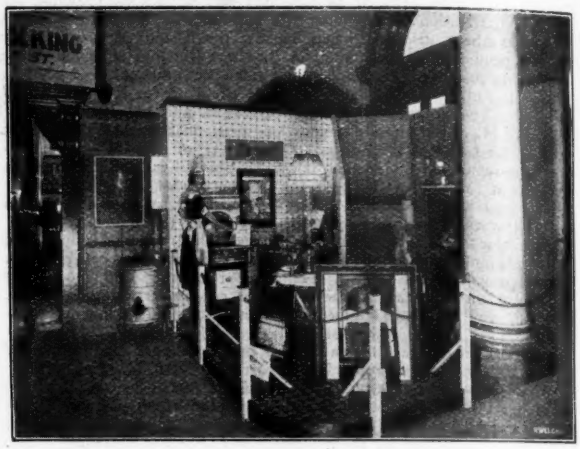
Mention was made in last week's "JOURNAL" of the opening by the Right Hon. the Lord Mayor (Alderman Sir William G. Turner) of a comprehensive Exhibition, promoted by the Corporation Gas Committee, in the Ulster Hall, Belfast. This hall is the biggest available for the purpose in the city; but were it twice the size it would have been none too big to accommodate the excellent display that has been got together and the large crowds that have flocked to see it. On the Saturday following the opening, for instance, no less than 5700 persons visited the hall; and it would not be at all surprising to hear that this figure has since been exceeded. Admission is free, so that there is nothing to prevent every housewife in Belfast from obtaining information which she should possess if she is to make the most of her opportunities. Success has, of course, not been attained without effort; and in congratulating the Gas Committee and Mr. J. D. Smith (the Engineer and Manager), mention must also be made of the hard work accomplished by Mr. A. M.'I. Cleland (Distribution Superintendent to the Gas Department), who, acting under the instructions of Mr. Smith, carried out the arrangements for the exhibition. Manufacturers in all branches have also done their share abundantly well.

Cookery lectures are given twice daily by Miss E. M. Dods, M.C.A., and these prove a great attraction. The minor hall has been fitted up as a demonstration room, and those desirous of hearing the lectures prove invariably more than sufficient to fill the 300 or so seats available. A good idea has been the placing outside the cookery demonstration hall of a number of cookers by Messrs. R. & A. Main, who are contractors to the Corporation. In the main hall a good deal of work was necessary, in the way of laying gas, water, and waste pipes, and it is noticeable that in carrying it out all possible precautions have been taken. Each stall has its own control cock, so that in the event of accidental damage to any of the soft piping this part could be promptly isolated from the remainder of the exhibition. In addition to this, the supply of gas is divided up to pass through five meters. The installation work was accomplished without a hitch, and in a very short space of time. The general lighting of the hall is by Sugg "Littleton" lamps, while the cooker stands are lighted by the same firm's "Imperial" burners.

On entering, the visitor is faced with the smoke abatement exhibit. Here is an effective illustration, on "B.C.G.A." lines, of the right and the wrong ways of using coal; while on either hand is an appealing tableau. One of these, entitled "Yesterday and To-Day," depicts the unhappy position of the maidservant in "coal-range" times, and the other shows how advantageous is the use of the gaseous form of fuel by which it has been superseded. On the other side is a pretty scene of the night watchman on a road in which main-laying operations are being carried out—his fire of gas coke (which is clean, economical, and smokeless) occupying a central position. Again on either side is an annexe. In one of these British Furnaces, Ltd., show a rivet heater capable of heating 100 lbs.



of rivets an hour, with one valve control, gas and air; a surface combustion oven furnace, giving temperatures up to 1400° C.; and soft-metal melting furnaces, both with air under pressure and with natural draught. Demonstrations with these are arranged as desired. There are also here a main baking oven (used in connection with the refreshment department) and a fish fryer. In the other annexe are miscellaneous exhibits, which include Stott water heaters, Cox's Radiophraghm griller, the "Docking" gas-fired boiler for central heating and hot water supply (shown by Messrs Ritchie, Hart, & Co., of Belfast), and a gas boiler of the Economic Gas Boiler Company, of Burnley. The "Economic" gas boiler is a substantial appliance, made with a double case of galvanized steel, packed with silicate cotton, and having an aluminium cast top, and parts in copper. Displays of "Leamington" cookers and fires by Messrs. Sidney Flavel & Co., gas meters by Messrs. Pinch-



"Yesterday and To-day."

beck, Ltd., and the specialities of the Horstmann Gear Company, Ltd., form attractive features.

WHAT COMES FROM COAL.

Next in order there is the exhibit of the Belfast Corporation Gas-Works Chemical Department. This department is a new branch of Corporation work, having been inaugurated only about two years ago; but already its success has been remarkable—the profits last year amounting to over £70,000. Attention is drawn to some fifty different articles, useful in the home or on the farm, that originate from these chemical works. It would be impossible to set them all forth here; but mention may perhaps be made of some. In the first place, there is an easily applied grease-removing jelly for cleaning cookers, enamel ware, &c.; and then a disinfectant sanitary tablet, of a size convenient for all household purposes. Other things are a worm destroyer, for clearing vegetable beds and at the same time enriching the soil; a non-poisonous weed killer, which can be used with absolute freedom and assurance of effectiveness, and which has been evolved after exhaustive experiments; a paint remover, which is simply applied with a brush, after which a scraper is applied; a liquid dog wash, which is said to cure mange and promote the growth of hair; and another wash that is highly beneficial to horses.

The all-important "working" exhibit is provided in the form of various stages of incandescent mantle making—demonstrated by Lighting Trades, Ltd., who show, among other processes, the knitting of ramie yarn, ring tying and pleating, and burning-off operations. Other lighting displays are by Messrs. W. Sugg & Co., Messrs. Falk, Stadelmann, & Co., and Messrs. Stevenson & Turner, Ltd., all of whom demonstrate the high efficiency and the artistic effects which can be secured with good gas lighting.

First-class displays of their latest specialities are made by Radiation firms—Messrs. Fletcher, Russell, & Co., the Richmond Gas Stove and Meter Company, Messrs. Wilsons & Mathiesons, and Messrs. John Wright & Co. "New World" cookers are displayed, and also several of the Radiation standard gas grates. A feature of the exhibition is the special show of large cooking apparatus suitable for hotels, large institutions, &c. Wilsons and Mathiesons' "York" fire is provided with a concealable boiling burner under the hinged canopy. When this burner is in use, the hinged canopy forms a perfectly secure boiling hob; and when the burner is not required, the closed canopy hides it from view. This arrangement does not interfere with the injector ventilator; and the burner, being separately controlled, can be used quite independently of the fire.

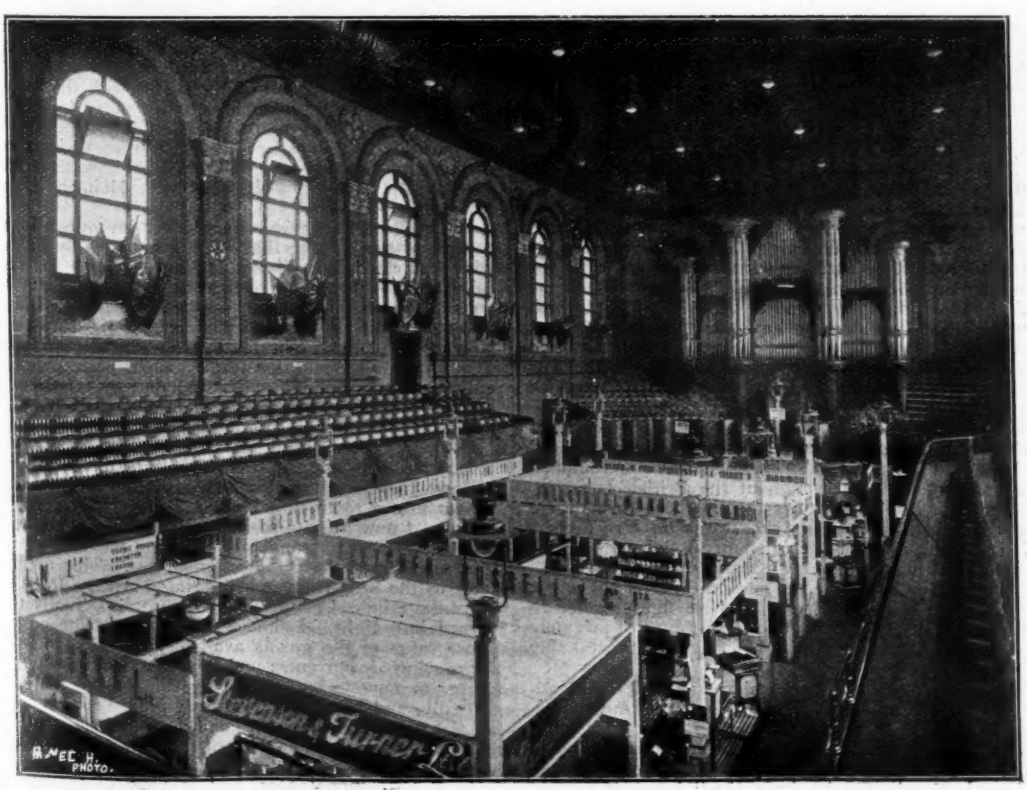
Another good display of cooking and heating apparatus is that of the Parkinson Stove Company; and the same remark applies to Messrs. R. & A. Main, who include on their stand the "Conservor" oven, in which the hot gases do not pass straight through the oven space and escape at the top, but after circulating throughout the space make their way out through a slot placed near the bottom. From this position they pass upwards between the outer casing of the oven and the enamelled inner casing (the latter being a unit that can be supplied to any existing oven), and finally leave the oven at the top. Messrs. W. Sugg & Co. also display a range of their "Chef" cookers.

By means of glass-encased meters on several stands con-

sumers can learn something of the care and skill with which these measuring instruments are designed. Messrs. Thomas Glover & Co. have on view one of their coin-counting machines —and this, by the way, was sold within an hour of the opening of the exhibition. Another useful reminder afforded by this firm is a frame containing every one of the 141 parts of one of their prepayment meters. On Messrs. Alder & Mackay's stand is another frame within which appear a collection of curios in the shape of coins, discs, &c., which have been taken from prepayment meters. They also show the "A. & M." pressure-wave lighting and extinguishing apparatus, meters fitted with their new diaphragm and prepayment attachment, and a demonstration meter illustrating the difference of value obtainable between a universal burner and a twin bijou preheated burner.

Messrs. Parkinson & Cowan show a number of their well-known specialities, the list including the Beasley recording calorimeter, the Parkinson vaporizer, and models and drawings of retort house governors. The Parkinson Stove Company are also well represented.

A new and attractive little device is the "Belfast" patent bed warmer, which is an item on the stand of Messrs. Stevenson & Turner, Ltd. This is a metal cylinder containing a special material which will retain heat over a long period. It is stated that, after lighted gas has been applied to it for five minutes, it will remain hot for four hours. For the purpose



of heating it is connected to a flexible tube, from which, when ready for the bed, it is removed.

An exceedingly popular tea room in the exhibition is run by the Bloomfield Bakery, who enjoy the advantages of a free gas supply, on the undertaking that everything sold by them in there shall be made and baked in gas ovens on the spot. Much interest is taken in the work, which is proving an excellent advertisement for the Gas Committee. This interest also extends to the afternoon teas, nearly 200 of which were served on the opening day.

DOMESTIC USES OF COAL GAS.

By ARTHUR FORSHAW, M.Sc., Chief Chemist to Messrs. R. & A. Main, Ltd.

[A Paper read before the Irish Association of Gas Managers.]

In expressing my appreciation of the honour you have done my Company and myself in inviting me to address your Association, I should also like to remark that the subject chosen is a very wide one, and that in the time allotted to me I cannot hope to do more than glance at the various sections into which it may be sub-divided.

Treating it from a general point of view, first let us remember that the whole of the present great enterprise known comprehensively as the gas industry is founded on the use of gas for domestic purposes—viz., the lighting of buildings, supplemented by similar work in the lighting of streets. It was only later that the invention of the atmospheric or bunsen burner gave a satisfactory solution to the problem of using gas for heating. Even then it was long ere its use for anything but domestic purposes became important. It must also be remembered that, large as are the quantities consumed by individual users for industrial purposes, yet so far the backbone of the industry is the domestic user, and always will be. It is only in favourable situations that the gas engineer can hope to dispose of any notable proportion of his output to industrial users. The great majority—particularly, I should imagine, in this part of the British Isles—must look to domestic appliances for any increase in gas sales. After all, the steady improvement in gas fires, and latterly in cookers, makes it easier, year by year, to prove their advantages to the potential user; and the no less steady increases in the number of consumers and the gas supplied show that there still remains a very large untapped territory ready for development. Not only is there this virgin soil waiting to be broken, but, in addition, that already in use will often repay more intensive cultivation.

After the lighting the cooker, after the cooker the gas fire, then the geyser, the circulator, the wash boiler, and the gas iron—such is the progression of the satisfied consumer. The present housing problem makes the increased use of gas a necessity, for many large houses have perforce to be divided into flats, and the instalment of cookers and geysers, at least, alone renders many of the conversions possible. It is difficult to find any very detailed figures to illustrate my remarks; but the following are taken from the "Gas World Year Book," in which the number of cookers and grillers supplied through the various gas undertakings has been published since 1901. Taking the quinquennial periods, these figures are as follows:

Years.	Cookers and Grillers in Use.	Increase for Five Years.	Average Increase per Year.
1900	837,253	..	..
1905	1,789,616	952,363	190,473
1910	2,747,671	958,055	191,611
1915	4,022,646	1,274,975	254,995
1920	4,915,846	893,200	178,640
1924 (4 years) . .	5,450,093	534,247 (4 years)	133,561

From these figures, it would at first glance appear that the increase per year is seriously declining; and this illustrates the fact that statistics must be used with knowledge and care, for actually the increase shown in the last year—viz., between the published figures relating to 1923 and to 1924—is 316,903, which is very much higher than that for any previous average year. That the average yearly increase should be low between 1916-20 and between 1921-23, is, of course, explained first by the war and, secondly, by the fact that abnormal conditions obtained both in the building trades and in the gas appliance industry.

Further statistics relating to what I may call the "degree of saturation" of existing gas installations by "stoves on hire" are given in "Field's Analysis." These figures are compiled for twenty-four large towns throughout the British Isles, excluding London. A summary shows that in these towns there are 2,104,429 consumers and 1,475,919 stoves on hire (a percentage of 70 on the numbers of consumers), whereas of the individual towns summarized the best figures show a percentage of 116 (*i.e.*, more than one stove per consumer), and the worst 2 p.ct. One has to bear in mind that these figures refer to "stoves on hire," and presumably take no account of privately owned appliances. At the same they show quite unmistakably that "saturation" is not complete.

It is further to be noted that the above statistics deal apparently only with the appliances the use of which is most widespread and appreciated—viz., cookers and grillers. For other appliances, such as gas fires and the various water heaters, while their enumeration would greatly swell the totals, yet, owing to their later introduction in popular form, the "degree of saturation" by them among present consumers must be very much less—that is, the scope for introducing them into households is much greater. Similar figures are now being published in the "Gas World Year Book" for gas fires to those already given for cookers; but the introduction of this useful feature is of such recent date that for our present purpose—that of estimating progress during a number of years—they are not yet full enough.

LIGHTING BY GAS.

Although I do not presume to speak with authority on the lighting question, yet it appears to me that, being the earliest use to which gas was applied, and being the use which is more particularly attacked by our friends in the electrical industry, a few words indicating where gas shows its superiority in this direction may not be out of place. There is no need for me to go into the costs of equal illumination by the two media, for this question naturally has been the subject of inquiry on many previous occasions, and has been definitely settled in favour of gas. This being the case, the opposition is reduced to claiming superiority for electric light on two grounds—viz., convenience (which I shall deal with presently) and the alleged contamination of the air by the products of combustion of gas, which, since there are no gaseous products of combustion when electric bulbs are used, has usually only to be mentioned to the average uninstructed person for it to appear to him as an unanswerable argument against gas.

This last argument, as used by the electrical industry against gas lighting, partakes both of the *suggestio falsi* and of the *suppressio veri;* for it insinuates that the products of combustion from the lights are present at breathing level in quantities injurious to health, which is not the case, and omits to mention that, owing to the small quantity of heat given off by electric lights, the air of rooms lighted by the latter suffers from two defects—viz., there is, comparatively, a very restricted movement of air by convection currents (and modern medical research has demonstrated the need of such movement if the atmosphere is to be healthy), and further there is no sterilization of what may otherwise be injurious products of respiration. It has been proved that "stuffiness" in rooms is not due to carbon dioxide—the latter is, in fact, not toxic in itself—but to lack of air movement without which the skin and mucous membranes cannot do their work properly. It has also been proved that, in addition to the superior amount of movement imparted to the air by gas lights, its higher temperature near the ceiling causes a very rapid diffusion through the walls and ceiling, and a corresponding inrush of cold pure air from outside into the lower parts of the room, with the result that the air in the breathing zone is actually purer in gas-lit than in electrically-lit closed rooms. I cannot pursue this aspect of the question in this paper; but those interested are referred for further information to the work of Sequard, d'Arsonval, Pettenkofer, Kruger, Flügge, Rideal, Hehner, Leonard Hill, and others.

With regard to convenience, modern inventions for the distant control of gas burners have brought gas fully on an equality with electric light. These devices may now be regarded as fully reliable, but they require bringing to the notice of the public; for, so far as I can see, we have, as an industry, neglected to make the most of our opportunity to remove the only point of disadvantage in comparison with electric light. I offer this remark advisedly, for I have taken the trouble to make inquiries among laymen, and I find that by far the greater proportion has never even heard of, much less seen, these easily-applied devices for lighting and extinguishing gas at a distance.

Before leaving lighting, there is one other point where I think our advantages may be used to bring more business. I have already mentioned fortuitous ventilation in the sense of air drawn into a room to take the place of that escaping by diffusion. I now refer to positive ventilation. It is hardly realized what a powerful means of ventilation we possess in the heat generated from the combustion of gas. This applies particularly to the heat from gas lighting burners, for a very small percentage indeed of the available heat is actually used-up and turned into light. I should expect that some 90 p.ct. of the gross value of the gas is available, after leaving the mantle, for moving air currents; and this only requires applying in the proper manner to become a very valuable ventilating medium. Actually, and from figures already published, it appears that if all the potential heat in a cubic foot of gas be utilized to the best advantage, it is capable of moving some 2000 to 2500 c.ft. of air.

In these circumstances, and in view of the many housing schemes on foot or contemplated, it seems to me that, if the

necessary attention were given to the matter, a standard fitting and flue could be designed for incorporation in new property. As I envisage it, it would consist of the necessary lighting burner or cluster suitably disposed in the apartment. If thought desirable, it could be housed in a milk-glass bowl, which undoubtedly gives the most agreeable light. Over the burners would be situated a flue of a suitable size proportioned to the apartment, and hence to the lights—that is, to the gas used. This, in its turn, would communicate with the chimney flue of the apartment. Obviously, the nearer the lights to the chimney, the easier to work-out the design. Combine this with a wall switch, and we have all the advantages claimed by the advocates of electric light, with the added ones of more illumination at a lower cost and a large measure of positive ventilation.

The Gas Oven.

Leaving lighting for a consideration of other domestic uses of coal gas, we find the most important one is for cooking. This application of gas has been the subject of considerable attention on the part of the gas industry and of the gas appliance industry during the last year or so. In consequence of this a large amount of fresh knowledge has been established, and a number of appliances, improved with a view to giving greater economy, have made their appearance. I have recently dealt at some length with the subject of economy in gas ovens;* and I do not propose to do more than put the conclusions before you on this occasion.

The first, and probably most important from the point of view of the amount of gas that may be saved, is connected with the initial heating-up of the oven from cold. From one cause or another, gas is usually burned at too high a rate during this period, with the result that the oven is ready for use long before the time usually recommended on the maker's card of instructions (say, 15 to 20 minutes). In addition to this, there is no doubt the user, in a great number of cases being occupied by some other task while the oven is getting ready, allows the time for heating-up to be exceeded. It is clear that the higher the initial consumption of gas per hour, the more will be burned to no purpose in cases of this sort. The question then arises as to how the matter may best be anticipated and dealt with. The reply to this may be found in the "Special Report on Oven Testing" presented to the Institution of Gas Engineers in June, 1924, by a Committee appointed for the purpose. From this we learn that, for any particular oven, there is what is termed a "normal maximum consumption," which is sufficient to perform the initial stages of cooking operations. When a packed oven is set to this normal maximum consumption, it will heat-up from cold to 400° Fahr. in 12 minutes, the temperatures being taken on a thermometer in the centre of the oven. An unpacked oven requires slightly more gas to do its work, and therefore will heat-up to the same temperature in 10 minutes.

This does not mean that 400° Fahr. is the temperature required for the initial stages of cooking, but the rate of heating-up (viz., to 400° Fahr. in 12 or 10 minutes) provides sufficient heat units to perform the initial stages of cooking. The distinction between temperature and heating units is a fundamental one; and I will go so far as to say that, once the food has been put in the oven, there is very little relationship between them. Thus a consumption of gas that is sufficient to maintain a definite temperature in an empty oven will cause only a much lower *temperature* in a loaded oven, although the *heat units* given to the oven space are the same. This is simply because cold foodstuffs absorb heat before their temperature can rise. As this process continues, the temperature of the foodstuff rises, and this reacts on that of the oven, which does the same. Consequently during actual cooking there is no constant temperature in the oven; it is a rising one, and therefore it is not possible to lay down that the temperature for cooking any par icular food is so-and-so. The most that can be said is that either the rate at which heat units should be supplied to a particular foodstuff is so many per square foot of food surface per hour, or, what really amounts to the same thing, provided the size of joint (say) is about the same each time, that the rate should be such as would maintain such-and-such a definite temperature in an *empty* oven.

You will now see the difference between cooking in the ordinary way by setting a constant rate of gas at the gas cock and cooking with the aid of a thermostat—a device that has obtained considerable use in America, and has been lately introduced into this country for controlling gas cooking. In use the thermostat maintains a given oven temperature throughout the cooking period; but since the foodstuff heats-up under these conditions, as it would under the ordinary conditions already described, the effect is to tend to raise the oven temperature as a whole. So soon, however, as the oven temperature starts to rise, the thermostat cuts off some of the gas. This process is continuous; and the net result is that, with a thermostat, a constant temperature is maintained in the oven space throughout the cooking period, during the whole of which the input of heat units per hour is being constantly reduced. Contrasted with this, as already indicated, the ordinary process consists of a constant input of heat units per hour and a constantly rising oven temperature. In both cases the temperature of the foodstuff gradually rises, though obviously at a different rate. Reverting to cooking by the ordinary method of control by the oven cock, it will be realized that, if the input of heat is so rapid that the surface of the food cannot absorb it and pass it on to the centre, the outside will burn before the inside is cooked. On the other hand, if the input of heat is very slow, the food will merely dry-up slowly without cooking at all; for cooking is the bringing about of certain physical and chemical changes in the foods, and is completed when sufficient heat has been passed into them to raise their temperature to a certain definite figure, which varies with the particular food. Between these two extremes there is an infinite number of rates of heat input, each of which will produce a different result in the food.

Economy in gas in the main cooking operation, after the initial stages (such as sealing the meat) are complete, may be promoted by selecting such a rate of heat input, and continuing it for such a time, that the food is raised to the requisite temperature to produce the desired chemical and physical changes without exceeding that temperature. Not only is economy in gas thus promoted, but so also is economy in the food; for food so cooked is more nutritious and more easily digested than that which has been allowed to exceed the required temperature. How far the general idea of "cooking temperature" is in error will be realized when I say that those quoted for bread and meat are usually well over 400° Fahr., and no doubt the uninstructed person thinks this means that the actual foods must attain such temperatures, whereas it cannot be too emphatically stated that no ordinary foodstuff should ever attain an internal temperature higher than 212° Fahr. (the boiling point of water), while meat, for instance, becomes harder and more indigestible the more its internal temperature exceeds 180° Fahr., at which coagulation of proteins occurs.

The Hotplate.

I have so far dealt with cooking in the oven only. As a matter of fact, much more gas is used for the operations of boiling, grilling, and so on, which are performed on the hotplate. All of you are familiar with the great improvements realized during the last few years in hotplate construction. The idea at the back of most of them has been to promote economy in the gas used. Until recently, indeed, economy has been sought after with little regard for the convenience of the user; and the result has been that hotplate bars have become full of cuts and gaps. There is no doubt that the object in view was attained; but the user has found it difficult to put small utensils on these bars without there being danger of their capsizing, and, further, the projections or the like have seriously interfered with that ease of cleaning without which such necessary work is neglected.

My own Company have seriously considered this matter; and we have come to the conclusion that thermal efficiency is not the only recommendation for a hotplate—there must be a study made of convenience for the user as well. In fact, as I have already remarked on another occasion, a balance must be struck between efficiency and convenience; and with this in view we have recently remodelled our hotplate bars so that, while they do not give quite such high efficiencies as our previous ultra-efficient type, yet they provide a secure resting-place for the smallest utensil, and, being free from vertical projections, can be easily wiped over with a cloth. At the same time they are interchangeable with our previous bars, and if the latter are preferred, they may be had at will.

The "Conservor" Oven.

Returning to oven efficiencies and economy, I may say that, as a result of research and experiment with an idea brought to our notice by Messrs. Thomas Glover and W. H. Wayte, of the British Gas Light Company, Norwich, we have introduced a new type of interior unit to take the place of the usual internal linings. This, on account of its special qualities, we have named the "Conservor" oven. Not only does it enable a greater degree of economy to be realized than has heretofore been the case, but from the point of view of the gas undertakings it has many other advantages. With regard to economy, the new "Conservor" unit promotes it for four reasons:

1.—It causes the products of combustion to circulate in the oven, instead of passing them straight through from bottom to top; and they are thus enabled to give up to the food in the oven more of the heat they carry.
2.—Owing to the design and position of the flue, cold air cannot be drawn through the cooking space, and so carry away and waste some of the heat.
3.—Because of the circulation of products, the temperature of the top and bottom of the oven space is much more equal than in the ordinary oven, and consequently the whole of the space is available for cooking.
4.—Cooking therefore proceeds much more evenly, and there is less possibility of spoiling food by burning.

With regard to the special advantages of this invention to gas undertakings, they consist in the following facts:

* "The Realization of Economy in Gas-Heated Ovens"—Waverley Association of Gas Managers, June, 1925 (See "JOURNAL," Vol. 171, p. 34).

1.—The unit may be applied to any existing ovens, thereby greatly improving them at a comparatively low cost. This does not require the old ovens to be sent to the works. Once one oven of a type has been converted, the remainder of that type may be fitted with conversion sets by the employees of, and on the ground of, the gas undertaking.

2.—When new cookers are obtained fitted with the "Conservor" oven, all their parts, with the exception of the actual enamelled sheets comprising the "unit," are fully interchangeable and standardized with those of our present cookers.

The gas undertakings are thus provided with new cookers designed to give perfect cooking with the utmost economy and ease of working, but no new stocks of wearing parts are required to be carried. In our opinion this is such an outstanding achievement that I am sure you will pardon the length to which I have gone in order to describe it to you. You will at any rate have gathered, I trust, that in perfecting and marketing this idea, great as the temptation may have been, we have deliberately refrained from building an entirely new series of ovens to embody it. We have preferred to adapt it to our existing system of standardization and interchangeability, believing that this would best serve the interests of the industry, and so eventually best serve our own. In this connection I think you will agree with me that, just as the hotplates must be designed with a view to a fair balance between efficiency and convenience, so must the ovens; and convenience in both these respects has three different aspects—viz., for the maker, so that his product may be standardized in design and facilitated in output; for the gas undertaking, so that maintenance (that is, renewals, repairs, and adjustments, with the stocking of the necessary wearing parts) may be made as small an item as possible; and for the user, so that cooking may be done with the least possible gas, trouble, and attention, and so that the cleaning of the appliance may be easy.

Clearly, in giving due weight to these factors, the maker will only be able to provide an appliance that is a compromise. It then falls to the lot of the gas undertaking and of the user to pass judgment on the result. I mention this because, if a gas undertaking should decide that it prefers some alteration made to suit its own particular purpose, the whole balance of the maker's scheme is apt to be upset; and this reacts both on his capacity for production and, in turn, upon other undertakings' supplies. The gas appliance industry, so far as I am acquainted with it, is doing its best to apply the principles of mass production to its output; and any alteration to standardized products made to suit individual undertakings, however willing the maker may be to embody them, cannot but interfere with his output in the manner indicated.

GAS FIRES.

Turning now from the subject of cookers, which is the most important domestic use of gas, the next in importance is that of gas fires. Potentially, it is perhaps more important than that of cookers; for whereas there is seldom need for more than one cooker per family, there is always the possibility of a gas fire in every room in the house—and indeed, convinced as we all are of the benefit to the country at large of any substitution of gas for raw coal, this is an ideal we may all set before us.

However, to come to the gas fire itself, it is an appliance that has been greatly improved during the last fifteen years—in fact, since the resources of scientific research were applied to it. Before that time it had gradually become an effective heating agent for apartments, but it had suffered from defects which prevented it from becoming more than the luxury of the few. With the removal of these defects, it is gradually becoming the necessity of the many. Briefly stated, the improvements that have taken place are in efficiency (for a fire may be effective without being efficient), in the provision of radiant heat for convected heat, in ensuring adequate ventilation, in silence, and, lastly, in artistic merit. It is an interesting fact that we, in the British Isles, have always produced and perfected gas appliances that differ greatly from those originated in other parts of the world. For instance, if you compare our cookers with Continental or American products, you will find ours are in general bigger and more substantially built. Reasons occur to me for these differences; but I do not wish to discuss them on this occasion, preferring rather to confine my remarks to fires, between the types of which adopted in the various countries no less difference may be observed.

Owing to our more equable and humid climate, and to our fortunate position with regard to cheap coal (I am, of course, alluding to pre-war days), as a people we had come to rely on open fires for our house heating. In America and on the Continent, where much severer extremes of weather are the rule, the closed stove became the standard method. The general difference in effect was that the former provided primarily practically nothing but radiant heat, and being installed under a chimney of large capacity severe draughts were the usual accompaniment; a normal air temperature of 55° to (say) 62° being the result with a thermal efficiency of roughly 20 to 25 p.ct. The latter, on the other hand, afforded practically nothing but convected heat, and, being ventilated by no more than a flue pipe just large enough to provide the requisite draught to burn the fuel, a very restricted quantity of fresh air reached the apartment, with the result that a stuffy atmosphere and a temperature of 70°, or even more, was the rule—the thermal efficiency being no doubt about 90 p.ct.

When gas came to be used in place of solid fuel, these diverse methods of heating having become standard, it was naturally attempted to imitate them, with the result that British gas fires were provided with some form of radiating material, such as asbestos, cast-iron frets, or fireclay balls, whereas the foreign preference was more for reflecting stoves, equipped with hot-air devices. Without having made any tests *ad hoc*, I should imagine that the thermal efficiencies were not very much different from their solid fuel prototypes, though rather more convected heat, and possibly rather more radiant heat, was given by some of the British gas fires as compared with coal fires. It was speedily found, however, that, with total efficiencies of this order, the cost of heating by British gas fires was a high one; and gradually design settled towards the narrow deep fire filled with hollow "ball" fuel, and provided with convecting chambers, which was the accepted type twenty years ago. These fires gave a percentage of radiation somewhere in the thirties, and in addition a certain amount of convection.

It is usually accepted that the complaints of users against them were due to this latter fact, because the air was heated by contact with very hot surfaces of metal, and further because these surfaces were practically impossible to clean, and so became covered with dust, which gradually charred, and thus imparted an odour to the hot air. The hot air being in a condition now ready to absorb more moisture, found its only source in the skins and mucous membranes of the occupants of the apartment, who were thus caused inconvenience. While no doubt there is a fair amount of truth in this supposition, for my part I believe the unpleasant sensations complained of by some people were more particularly due to the escape of products of combustion into the apartment; for those old fires burnt a comparatively large amount of gas, and were provided with, to modern ideas, ridiculously small flue outlets. Unless, therefore, great care was taken in fixing them, products were bound to escape. I am all the more inclined to this view since I lived for some ten years in a house in which every room, except the two rooms for meals, was provided with an old type gas fire connected to the chimney by practically air-tight joints, and I do not remember any complaint ever being made.

At any rate, be the reason what it may, the present popularity of the gas fire began when the radiating surface was altered from deep to shallow, with the result that the percentage of heat delivered to the apartment in the radiant form went up immediately into the forties, and after continued research was gradually improved into the fifties; while at the same time flue outlets were gradually increased in size, until by this means, and by attention to the internal contours, fires were enabled to pass all their products of combustion through the flue outlet without the aid of any flue pipe or chimney pull whatever. You will realize that, when this stage was reached, and the fire was attached to an effective chimney, we had returned to our original national open fire with a large amount of ventilation; the essential difference being the substitution of gas for solid fuel, and the approximate doubling of the thermal efficiency with respect to radiant heat. I am bound to point out, however, that if this large quantity of ventilating air is insisted on, then, as with the coal fire, you cannot expect to convey to the apartment any useful percentage of direct convected heat—it is inevitably drawn up the chimney.

The realization of this has caused several attempts to be made to design fires that will give the present high percentage of radiation, and yet deliver a further quantity of heat to the apartment in the form of hot air. It would appear, however, that considerable alterations are required in design and construction before success can attend these efforts, and that consequently, granted a successful fire can be made, its price is likely to be notably greater. The difficulty is a fundamental one, and depends on the relatively small quantity of heat carried by a given volume of air. For instance, 1 c.ft. of air at 50° would require heating approximately to 100° before it had absorbed 1 B.Th.U. (and incidentally it would then be capable of absorbing roughly five times the weight of water vapour as at the lower temperature). This means that to carry any significant quantity of heat from a gas fire by convection, there would have to be comparatively large heat interchange surfaces or alternatively they would have to be particularly hot.

Of the other directions in which gas fires have been improved—viz., silence and artistic merit—since every person is his own judge of these matters, there is no particular need to give further time to them than to say that reasonable silence is a *sine qua non*, while so great is the choice among designs to-day that every taste can be satisfied.

THE IMITATION COKE FIRE.

There is one other type of gas fire that has attained a very high degree of popularity—the imitation coke fire. The outstanding merit of this fire is that it has been instrumental in converting a large number of coal users to gas. They are, in the main, people who object to the regularity and sameness of the more efficient upright gas fire radiants. For sheer efficiency

the upright radiant is clearly superior; for, in addition to the fact that its construction enables it to afford actually a higher percentage of radiant heat while the surrounding casting provides a further percentage of convected heat (depending on the degree to which the possibility of passing a large quantity of ventilating air to the chimney is realized in the fitting-up), it throws its radiant heat mainly straight out in a direction parallel to the floor, whereas an inclination of the fire front causes the main direction to be more towards the ceiling—which is hardly so desirable in heating the room as a whole. The tendency of warm air, into which all the radiant heat is eventually converted, is to rise; and therefore the more we heat the lower parts of the room the more we promote sensations of comfort. This is particularly the case where large quantities of fresh air are drawn into the room by the ventilating effect of the chimney—in the absence of bottom heat the feet and legs are apt to become chilled. However, these are minor disadvantages compared with the fact that, as I have said, fires of the type of our "Cinderella" are effective, appeal very greatly to some people, and are the means of converting to the use of gas many who would otherwise fail to make use of its advantages.

WATER HEATING.

I must now pass on to mention briefly other domestic uses of coal gas. After cookers and fires, by far the most important is that of water heating. This takes two main forms—viz., spot heating by "instantaneous" heaters or geysers, and storage heating where the heater is attached to the existing circulating system either in place of or auxiliary to the range boiler. In storage heating there are also two chief subdivisions, according as the heater and storage are separate, as in the use of "circulators," or are combined, the burner being then placed so as to heat the storage directly. Each of these forms has its own particular advantages and disadvantages, which may be broadly stated as follows:

Geysers are placed at the spot at which the hot water must be delivered, such as a bath or a sink. They give the highest thermal efficiency of any gas-heated appliance, and are at all times ready for instant production of hot water. Against these advantages must be set the facts that, being usually made of copper and of more or less intricate internal design, they are comparatively costly and usually difficult to clean in hard-water districts, where much scale may be expected. This last remark applies more particularly if the water is required at temperatures higher than are necessary for the bath; for the usual hard water does not deposit scale quickly at bath water temperatures. Although geysers give very high efficiencies—up to 98 p.ct. or more in some types—the practice of mounting them with the spout several feet above the bath level always strikes me as singularly inept; for the stream of water has to travel through the air and eventually splash into the bath, and in so doing, efficiency, hardly won by designers and manufacturers, is woefully dissipated. This is particularly the case where a small geyser is used, for the output is correspondingly small, and the time to collect a reasonably full bath is a long one, during the whole of which the water, once away from the geyser, is cooling-down. If it be necessary to mount geysers thus high up, at least a rubber hose should be used for conveying the water into the bath with the minimum loss of heat. For baths, indeed, the bigger the geyser the better, so long as the gas piping and meter are of adequate size.

The circulator is usually made of cast iron, and its initial cost is the least of all these types of heaters. Whether fitted as auxiliary to the range boiler or as the sole source of heat, it is attached by more or less piping to the storage system of the house. Before hot water can be drawn, all the bulk in the storage has to be passed through the circulator once or more times, according to the temperature required. This process can be shortened by having alternate return pipes with a control cock allowing either to be used. The alternate one is arranged to return from a point so high on the storage tank that a few gallons only are in circulation, and so become hot much more rapidly, and, of course, with less gas. It is usual to fit a thermostat on the return side of the circulator for the purpose of controlling the gas so that a definite temperature is maintained in the storage tank. Such a circulator must have a handhole or a joint so that it may be properly cleaned in hard-water districts. Cast iron is also liable to corrosion in various soft-water districts; and though this may be often mitigated by "Bower-barffing" or other process, there are several waters with which even these precautions are ineffective, and circulators of copper must be used. The principal disadvantage to the circulator is that, having to make good the losses from the storage and from the connecting pipes, it requires, usually speaking, at least some 10 c.ft. of gas per hour for the purpose; and if the provision of hot water ready at any time, night or day, is aimed at, this is apt to become expensive. This expenditure of gas on maintaining temperature may be considerably reduced by suitably lagging the storage and the circulating pipes, and for my part I should strongly recommend the free use of lagging material in all cases of heating water by gas.

The other form of attachment to the house system is the storage cylinder with a burner under the bottom. This should take the place of the original storage tank, and not be auxiliary to it, or else its chief claim to consideration—viz., its low consumption of gas for maintaining temperature, owing to the absence of flow and return pipes—is taken from it. Needless to say, similar arrangements and construction are necessary for dealing with hard and soft waters as in the case of the circulator. Its drawback is that, in starting from cold, all the water in the storage must be heated-up before any hot water can be drawn off; but since its chief advantage, compared with the circulator, is the small quantity of gas required to maintain the water hot—especially if the cylinder be effectively lagged—it is usually selected for this reason, and kept in continuous use, so that the difficulty does not arise.

A trouble or inconvenience suffered equally by gas and by solid fuel heated circulating systems is the annoyance caused by having to draw off a considerable quantity of water at remote cocks before hot water makes its appearance. This may always be got over by arranging a secondary circulation; but it must be recognized that for this convenience a considerable consumption of gas is required. If the consumer is prepared to go to this expense for the sake of convenience, the secondary circulating pipes must be lagged, otherwise dissatisfaction at the size of the gas account is inevitable.

CONCLUDING POINTS.

With other domestic gas appliances I have no time to deal on this occasion; but I cannot conclude without mentioning one or two matters the lack of attention to which may spoil the performance even of the best-designed appliance.

It is, for instance, often found that very poor results are obtained from gas fires, or particularly from geysers. The reason is generally to be traced to inadequate piping and/or too small a meter. My own feeling is that ¾-in. iron piping should never be used at all; but I have seen many gas fires so supplied. The labour costs of running bigger sizes cannot be much more. Even ¾-in. iron should not be run for any distance over (say) 10 ft. as a connection to a gas fire, while the effectiveness of geysers absolutely depends on having an adequate supply of gas. Meters, again, are often notoriously overworked. No meter should be asked to make more than four revolutions a minute, and is better in every respect if it can pass sufficient gas at the rate of two revolutions a minute. Another cause of complaint of the same order is the often totally inadequate throughway in gas cocks. It is no uncommon thing to find the hole in the plug not only less than half the area at the pipe it controls, but also part of the hole made ineffective by lubricant collecting in it. Some installations with these features are the inevitable legacy of the past; but do let us make sure that nothing of the sort is allowed to interfere with the popular use of gas in the new property which is now being built or is in contemplation.

Another very important side of gasfitting, neglect of the principles of which has been responsible for disappointment in a number of cases, is that of flue pipes. Time will not permit entering into the subject now. I have dealt with it at length on a recent occasion;* reprints of my remarks are still available. Those interested may obtain them from my Company.

As an industry we have the satisfaction of knowing that every single step we take towards replacing the use of raw coal by gas is not only helping our own particular interests, but those of the nation at large. We conserve the mineral wealth of the country; we employ it to greater advantage by extracting from it the enormously useful and valuable bye-products; and, not least, we help towards the elimination of the deadly pall of smoke that has caused so much preventible suffering and material damage throughout our large towns. No alternative form of energy can make these claims. So long, then, as gas can be supplied at such a price as to make its employment attractive to the general public—and I suggest 2s. 6d. per 1000 c.ft. as a maximum figure—we need fear no economic competition from any source whatever.

Discussion.

The PRESIDENT remarked that Mr. Forshaw had dealt fully—in the time at his disposal for a technical paper—with this very interesting subject; and he was sure they were all greatly obliged to him for coming and giving them the benefit of his experience and research. Gas undertakings and gas apparatus makers were all proud of the fact that they produced something which lightened the load of the housewife, and helped her to carry on. Gas for cooking, heating, water heating, and ironing was much appreciated, and was daily increasing in popularity in Belfast. It was very satisfactory to note that many of the bedrooms in the new houses were being fitted with gas mantel registers. These were only applicable when the makers produced a thoroughly reliable burner that would not give any trouble in lighting-back. He thought that this was a very great and important accomplishment; and the majority of consumers who were for years prejudiced against gas fires were agreeably surprised when they tried the modern product, which was not only reliable, but silent.

Mr. J. A. PEMBERTON (Sligo) said Mr. Forshaw had spoken of an adequate flue; but did not an adequate flue, with anything like a pull on the chimney, affect the radiant efficiency of the fire?

Mr. FORSHAW replied that the influence of the air removed by the chimney on the radiant efficiency of a gas fire could be quite considerable, but that it could be practically entirely prevented by attention to design. Since radiation was proportional to the fourth

* "Flues to Gas Appliances"—Scottish Salesmen's Circle, February, 1925 (see "GAS SALESMAN" for Feb. 25, p. 42).

power of the absolute temperature, they would see that a cooling of the radiants by a very few degrees would have a considerable effect on the radiant efficiency. To prevent this, it was necessary to protect the radiants from the cooling influence of air drawn into the flue outlet by arranging this in such a manner that the air did not come in contact with them on its way to the chimney. Such construction was embodied in all modern fires by reputable makers. With regard to chimneys in which there was a very strong "pull," it might be advantageous, in some circumstances, to minimize this "pull" by means of a flue pipe reduced to a size somewhat smaller than the full area of the flue outlet; otherwise, as he had indicated in the paper, no convection whatever would reach the apartment from the metal parts of the fire itself. Such a device should, however, be used with great caution, or there would be the danger of removing too little ventilating air, and so tending to promote "stuffiness" in a room where the fire was in use for long periods.

Mr. J. M'NICHOLL (Cork) said he understood the author, when referring to the effect of heating by convection, to state that the "prickly" sensation one had with old-fashioned gas fires was due more to products of combustion than to the heating of the air. He had always understood that by merely heating the air one got this "prickly" sensation. With regard to flues, he had come to the conclusion that there were certain circumstances in which it was impossible to get a satisfactory flue. He referred to a case in which almost every expedient had been tried, and yet with the wind in a certain direction there was a sort of reflex current from an adjoining wall, and a down-draught resulted.

Mr. FORSHAW replied that the "prickly" sensation was a big subject, and one might argue from either point of view. On the question of down-draught, it was impossible to lay down any hard-and-fast rules. Every case had to be treated on its merits; and they would find the general principles fully dealt with in the pamphlet to which he had alluded. He could say this—that he believed any case whatever could be cured by resort to one or other of the means there described, or at any rate to devices based on the general principles.

IRISH GAS-WORKS PROBLEMS.

By T. J. REID, of Ballina.

[A Paper read before the Irish Association of Gas Managers.]

The title under which these remarks are framed is not one of my choosing; and I should have preferred a caption such as "The Association and the Industry," for it is the Association's relationship to the problems which confront the gas industry in Ireland that I would principally direct attention.

It may be remembered that at our last meeting I had something to say in similar strain; and though very little interest was then aroused, I am returning to the subject in the hope that in the interim some thought may have been given, consciously or sub-consciously, to a question which I conceive to be of the greatest importance, and that the necessary interest may be aroused and a stimulus applied which may fructify in something definite and tangible being done to make this Association a more active force in the industry whose interests it is supposed to serve. At the start I wish to make it abundantly plain that it is not my desire or intention to depreciate the work which the Association has performed in the past. I pay full tribute to the useful influence it has been in educating and moulding the opinions of its members individually and corporatively; and it is merely to suggest that it has to an extent outlived its possibilities in that direction, and that its sphere of action might be enlarged and its powers increased so as to become the ruling and guiding force in every respect in a united Irish gas industry.

It may be asked, not without reason, What is wrong with the Association? In view of the successful meetings last year and this, it may not appear that anything more is required. Certainly we have been provided with an admirable programme; but apart from the President's address, what actual interest are we as members taking in the provision of material for our meetings? We have all the panoply, pomp, and circumstance which attend meetings of the kind. We have the Press fully represented; we have lectures—by others. The social amenities receive due attention. We meet, listen, enjoy ourselves; but, I ask, to what extent do we benefit more than those who read the report of our meetings in the technical journals? It may be countered, in reply to this, that if there were no meetings there would be no Press reports. True; but surely it cannot be contended that all this effort and expense are required to provide Press material which might more easily, and with as much advantage, emanate therefrom in the first instance. I am not forgetful of the benefit to be derived from the meeting together of so many minds with a common interest; but such benefit is ancillary to the Association meeting, and is unofficial. The same results might be attained by meetings of a more informal nature.

I have suggested that the Association's usefulness in an educative direction has ceased to a large extent; and I know that our hard-working Secretary finds it increasingly difficult to persuade members to contribute papers upon such subjects as of yore comprised the greater portion of our programmes at annual meetings. The reason for this reluctance to contribute papers may be variously explained. First of all there is the undoubted fact that our members are better equipped in the knowledge of all that pertains to successful gas managership, and no longer find any interest in discussing matters which in former years possessed a feature of novelty, but which are now commonplaces of every-day work. The absence of anything of outstanding excellence or otherwise to record forms some excuse for the absence of papers; but members should not refrain from giving details of ordinary affairs which might, perchance, prove an inspiration to others. Secondly, the Technical Press, with its records of anything novel or instructive, providing all that may be necessary in this respect, has appropriated most of the material which might otherwise form subjects for discussion at our meetings. Deprived of its old-time claim of being the most suitable stage upon which new departures might best be exhibited, the commonplace only remains; and I am afraid that unless we can offer inducement in some other direction, the difficulty of obtaining papers will increase, and the interest of members will become entirely of a vicarious nature. Are we content to allow such a condition to arise, without doing our best to alter or prevent it? What can be done to make the Association something better than it is?

An examination of past programmes shows that the manufacturing side of our business has received most attention; and, for the reasons stated, this does not afford the possibilities in the way of papers or discussion that it did. Problems of this type are no longer the problems they were; and the greatest questions confronting the Irish gas industry are executive and administrative, especially on the selling side of our business. The whole venue has changed. The process of time and affairs has operated to pivot the focus of our outlook from within our works to without. The problems of making gas to the best advantage as may suit our various localities no longer occupy the chief place in our concern. The greatest problem which confronts the industry to-day is how best to sell the gas we make. This requires a different type of intellect, an acquaintance with the psychology of selling, and demands even greater resource and character than any required in the actual process of manufacture. The methods that may be adopted to sell our gas might well form the subject of papers suitable for discussion here. I am not going to dwell to any great extent on the *modus operandi* which should be adopted, as various places may require different treatment.

I would advance the opinion that service should be the inspiring motive in this as in every other enterprise. To give our customers the very best that we can, and leaving nothing undone to render the use of gas indispensable to them, should be the general method to adopt. If this idea is faithfully adhered to, it necessarily means methodical and constant supervision of all the appliances in which gas may be used. Spasmodic and tentative methods will not do; and a regular system of inspection and supervision will alone ensure success. Selling gas at the lowest figure, while good in itself, is not sufficient; and consumers may get more actual benefit with gas at a higher price where such supervision prevails than where cheap gas alone is relied upon to create demand.

The problem we have to face is that of making the public fully interested and aware of all that gas is capable of in ministering to its commercial, business, and domestic well being. I think this is a more difficult problem in Ireland than elsewhere, for many reasons, not the least of which is the inordinate faith in electricity as the best medium for compassing these requirements. Paradoxical as it may appear, this obsession is greater and more difficult to combat where electrical competition is not an accomplished fact, but only looming on the horizon. As a potential competitor, electricity is capable of being as great a deterrent to the use of gas as is actual competition. Indeed, it is probably a greater deterrent. There is a psychological reason for this condition, as people imbued with the idea that electricity must be the ultimate fulfilment of all their requirements are, in the absence of facilities for putting their predilections to the test, in actual practice, liable to be unconsciously apathetic and even antagonistic to the means at hand in the form of gas, and observe a reluctance in being persuaded to adopt what, in such a state of mind, they consider an inferior agent. How best to meet this difficulty, remove the feeling of inferiority, and create a better atmosphere in which the use of gas judged by its actual and undoubted merits as distinct from those admittedly possessed by its rival electricity, are really serious problems. We have to approach them in no spirit of antagonism to our rival, but by pressing home as best we can the fact that the use of gas for any purpose is not evidence of lagging behind in the march of progress, but is actually being in the forefront, and utilizing the best means possible to achieve the object in view. As I have said, this is more difficult where the possibility of comparing both agents—gas and electricity—does not exist; for we are so prone to attach superlative attributes to the unattainable.

There are some people so constituted that they must have

what they consider the best; and it is our problem to bring about the conception that in using gas they are indulging this laudable ambition. A great deal has been done in this direction by the British Commercial Gas Association, which, by its advertising campaign in the ordinary Press, is quietly instilling into the public mind that in the various applications of gas is to be found a most useful and effective servant which, if it does not wear the gorgeous livery of its competitor, is yet possessed of those sterling qualities which befit the perfect minister to our wants, and adds to those qualities withal a presentableness which lends lustre to, rather than detracts from, the most distinguished personages or menages. Can our Association do nothing to co-operate in this good work? I think it can; and it might well use its influence so that the Irish industry contributed its share, and reaped the benefit therefrom, not only in actual results, but in the consciousness that it was a partaker of blessings which it had done something to merit.

Electrical competition has entered upon a new phase with the commencement of the Shannon scheme—a Government venture which has been variously criticized. Whatever may be our opinions regarding State-financed electricity, I am of the opinion that if we must have competition, it is much more preferable that it should come in this way, when it may be expected to be carried out with more regard to the necessities of the case, rather than through the advent of individual schemes launched more with the idea of first killing-off the existing gas concern than with a well-considered object of meeting the true requirements of the community concerned. I believe the powers that be are favourably disposed towards existing gas concerns, and, where these have put their houses in order, are prepared to consider these as being most suitable for the control of bulk electrical current in the various localities in which they may be situated. This is a reasonable view of the matter; and there can be no question regarding its wisdom as affecting the economy of supply in the areas concerned. We should see to it, therefore, that we are in the position of being able to convince the authorities, when the time comes, that the best interests of the public will be safeguarded by entrusting to us the distribution of current as and when it is required. These are some of the problems—by no means all—which concern the gas industry in Ireland, and which might conceivably occupy some of our attention as an Association.

I am now going to suggest a more revolutionary enterprise for our consideration; and while I do not for a moment expect that it will receive universal approval, it will be interesting to hear such objections as may be forthcoming. The name of the Association is one which might pardonably lead the uninitiated familiar with the deliberations of other organizations connected with trade to imagine that considerations of personal moment were our chief concern, whereas, to our credit, that which affects the welfare of the industry alone forms the object of our meeting. When, one wonders, will labour organizations, whose members are as vitally concerned in the success of the various trades with which they are connected as the members of this Association are in the gas industry, be used to further the interests of industry instead of being purely for personal benefit? Notwithstanding the view taken as to the object of our Association, is it not a matter for comment that the commercial side of the industry receives little or no attention? Why should this be so? Why is it that our advice and opinion may be counted upon when it is a matter of engineering or manufacturing or even salesmanship which is involved, but information not less useful and important regarding the commercial and purchasing side of our business is not considered necessary or expedient? If the interests of the industry as a whole received our whole-hearted appreciation, would it not be thought fit matter to discuss how to buy as well as how to sell? Surely one is as important as the other! Why should there not be effective combination in this respect as well as in every other matter which affects the interests of the industry? In short, I am suggesting that the gas industry be properly organized in all its activities, and that this or a similar Association might perform for the gas industry what the Agricultural Wholesale Society does for the farming industry in Ireland. I know the many difficulties which would have to be surmounted, but are they insuperable? The various trades which act as suppliers to the gas industry are organized; and surely there cannot be any question as to the advisability of combination in the industry which they serve. Nor can there be any question regarding the economies to be effected from the establishment of a central purchasing and distributing organization properly conducted in the interests of contributing gas concerns. We have a number of trade representatives here; and doubtless they will express their views on this suggestion.

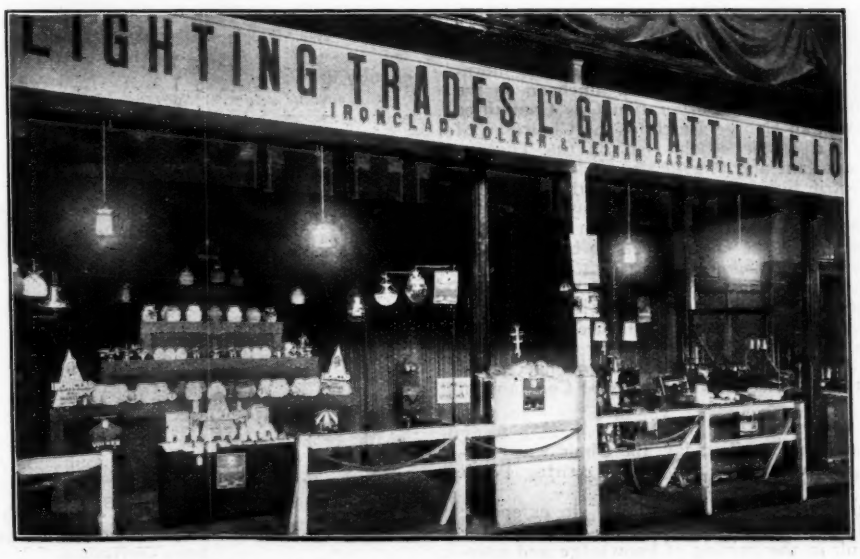
I leave the matter in this nebulous position, trusting to the discussion, which I hope will follow, to develop any merit which it may possess, or point out the difficulties and objections which, no doubt, will be apparent. I shall end my remarks on this note: If service to the public is our primary object, as I think it should be, nothing which may stand in the road of such service should be allowed to interfere in its fullest realizations.

Discussion.

Mr. J. A. PEMBERTON (Sligo) said the author spoke of their particular competitor electricity. Might he suggest that the most serious competitor electricity had in Ireland was the gas industry? Some combinations who supplied both had found gas to be so serious a competitor of electricity that they had given up the supply of gas so as to boost the electricity undertaking—a course which he understood they now very much regretted. Regarding electrical competition, there was a very good example in Carlow, where, in spite of it, a continual increase was shown in gas consumption. Let it rather be taken that the electrical industry found it very hard to live where there was a gas supply. Stoking machinery was deserving of more consideration than it had so far been possible to give in Ireland. He hoped they would be able to find some means of making gas at a lower cost. In this country there appeared to be trouble in getting undertakings to subscribe to the "B.C.G.A.;" but on several occasions he had received inquiries sent to his Company by the Association, which had resulted in business. A recent advertisement in the "Daily Mail," too, had resulted in an order going to his Company, though he had paid nothing towards that advertisement.

Mr. W. MILLAR (Cookstown) said his undertaking was under the necessity of selling electricity itself or allowing someone else to do so. His Company had therefore already taken the bull by the horns, and he anticipated that the present staff would be able to do most of the additional work entailed by the adoption of an electricity supply as well as gas. He could quite see that they were going to get a good deal of custom from people who had never troubled the gas-works.

Mr. REID remarked that Mr. Pemberton would treat the coming of electricity as a matter not to be worried about; while Mr. Millar adopted the plan of forestalling the competitor by supplying the rival commodity himself. Well, he was inclined to think the latter was the wiser course. What he wished to impress upon them was that this Association, which included a great number of managers of small works, should not lose sight of small things in favour of the larger ones. Another thing he wanted to emphasize was the necessity for solidarity in the industry: for it was more evident now than ever that what affected the smallest concern in the country affected the whole industry.



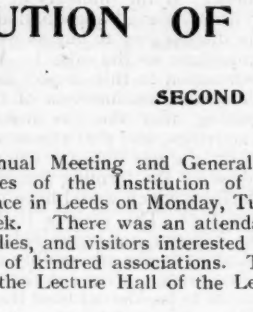
MESSRS. LIGHTING TRADES' STAND AT BELFAST.

INSTITUTION OF PUBLIC LIGHTING ENGINEERS.

SECOND ANNUAL MEETING AND CONFERENCE.
LEEDS, Sept. 14, 15, and 16.

The Second Annual Meeting and General Conference held under the auspices of the Institution of Public Lighting Engineers took place in Leeds on Monday, Tuesday, and Wednesday of last week. There was an attendance of some 200 members, their ladies, and visitors interested in public lighting or representatives of kindred associations. The business proceedings were at the Lecture Hall of the Leeds Philosophical Society.

On Monday evening the visitors were entertained at a civic reception and "At Home" given by the Rt. Hon. the Lord Mayor of Leeds (Councillor C. G. Gibson) and the Lady Mayoress, at the Leeds City Art Gallery. Following this very



THE PRESIDENT,
Mr. C. S. Shapley, Engineer and General Manager of the Leeds Corporation Gas Department.

enjoyable function the visitors were conveyed by motor coaches for about an hour round the chief thoroughfares of Leeds, in order to inspect the system of lighting in operation. In the course of the drive, various points and features were explained by Mr. C. S. Shapley, the Leeds City Gas Engineer and General Manager and head also of the Lighting Department, and by members of the lighting staff, who assisted as guides.

Leading members of the lighting industry who accepted invitations to be present at one or more portions of the conference proceedings included Mr. C. F. Botley (Hastings), President of the Institution of Gas Engineers; Mr. J. Wilkinson, O.B.E. (Nottingham); Senior Vice-President of the Institution of Gas Engineers; Mr. W. E. Price, Hon. Secretary of the Institution of Gas Engineers; Mr. F. W. Goodenough, Chairman of the British Commercial Gas Association; Mr. Leon Gaster, representing both the Illuminating Engineering Society and the National Safety First Council; Mr. R. B. Mitchell, President of the Incorporated Municipal Electrical Association; Mr. W. B. Woodhouse, President of the Institution of Electrical Engineers; Sir John Eaglesom, K.C.M.G., Vice-President of the Institute of Transport; Mr. C. E. Allsopp (Bradford), representing the Electrical Development Association; and lighting, gas, and electrical engineers from many city, borough, and other local authorities in various parts of the country.

The proceedings comprised business meetings on the mornings of the Tuesday and Wednesday, with a luncheon on the Tuesday at the invitation of the Corporation Gas Committee (presided over by Alderman George Ratcliffe, the Chairman of the Gas Committee); a motor coach visit on the Tuesday afternoon to Templenewsam and Harrogate; and a highly instructive gas and electric lighting exhibition in the main hall of the Leeds Town Hall throughout the three days' period of the conference. In connection with the exhibition Mr. Shapley had arranged for sections of the city's streets to be lighted by various manufacturers' appliances, so that visitors could inspect the products in actual use on normal public lighting service. On the Wednesday morning, before the resumption of business, Mr. Shapley, who by that time had been elected the new President of the Institution, accompanied by the members of the Council and a large gathering of ordinary members, laid a wreath at the foot of the Leeds War Memorial Cenotaph in City Square.

THE LORD MAYOR'S WELCOME.

At the business conference on Tuesday, the Chair was occupied by Mr. S. B. LANGLANDS, of Glasgow, the retiring President.

The LORD MAYOR (Councillor C. G. Gibson), in extending an official welcome to the visitors, expressed the hope that the conference would result in the gaining of knowledge and interchange of ideas between the members of the profession, so that they could the better carry out their important work in the public service. Leeds had made very great strides in public lighting since Mr. Shapley came to the city. They had at present some 18,000 public lamps, costing about £9000 per annum to maintain. Mr. Shapley had had a titanic task after the war in making good the ravages of small boys during the period when the normal amount of attention to such matters could not be given. There was no doubt good lighting had a very important bearing on the prevention of crime; and it was good to recollect that, in addition to a force of some 800 policemen, they had a vast army of silent policemen in the street lamps. [Hear, hear.] They in Leeds were proud of Mr. Shapley, and delighted that the Institution was to do him the honour of electing him President. Mr. Shapley was only a comparatively young man; but he was no worse for that. If one came to look around the heads of public departments in Leeds one realized that they were a pretty young lot, from the Lord Mayor downwards. [Laughter.] Most of their departmental heads were men in their forty's; and if they lacked anything in length of experience, they made it up in vitality, virility, knowledge, and keenness.

Mr. S. B. LANGLANDS thanked the Lord Mayor for his welcome, and the kindness shown to the visitors since their arrival in Leeds.

MEMBERSHIP ROLL.

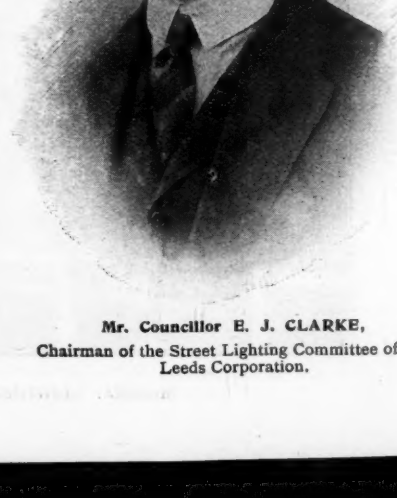
The HON. SECRETARY (Mr. W. J. Liberty) read a substantial list of new members.

INDUCTION OF THE NEW PRESIDENT.

Introducing Mr. C. S. Shapley as the new President, Mr. Langlands said that in him they had a man of dominant force, a man who knew his work, and one who entered wholeheartedly into anything which he took upon himself to do.

Mr. SHAPLEY, in taking the chair, contented himself at the moment with expressing his thanks for the honour done to him and to Leeds. He would say no more until the time for his Presidential Address later in the conference.

Councillor E. J. CLARK, Chairman of the Leeds Lighting Committee, adding his welcome to that of the Lord Mayor, said he felt signally honoured that, in his first year as Chairman of the Lighting Committee, the Institution should elect the Leeds Engineer as their President so early as the second year of its existence, and that he (Councillor Clarke), as Mr. Shapley's Chairman, should be the first person to make a speech under his presidency. He was convinced that the Institution had elected a man of broad vision, and one who was a credit to the public lighting service. [Hear, hear.] Lighting engineers not only gave an important public service as such, but they bestowed on the public benefits which the average person hardly realized until something went wrong. One sometimes heard it suggested that such conferences were merely "joy-rides." He hoped and believed that accusation could not be levelled at the conference of Lighting Engineers, who had



Mr. Councillor E. J. CLARKE,
Chairman of the Street Lighting Committee of the Leeds Corporation.

very much to investigate in the public interest and the interest of the profession. They had the previous evening seen an excellent lighting system in Leeds; and the man responsible for it was their new President, Mr. Shapley. [Applause.]

The PRESIDENT proposed thanks to Mr. Langlands for his services as President during the past year, and said he was entitled to special tribute as one who, being the first President, had borne "the brunt of the batting" in the Institution's first year. He had set his successor a hard task to follow him.

Mr. J. F. COLQUHOUN (Sheffield), in seconding, said Mr. Langlands had set going a machine which it was now their duty to keep running smoothly.

Mr. LANGLANDS, in replying, expressed his pleasure to see present that day the President of the Institution of Gas Engineers and their Hon. Secretary, and the President of the Incorporated Municipal Electrical Association. Their presence showed that the new Institution were getting the recognition to which they were entitled.

On the proposition of the PRESIDENT, the meeting unanimously agreed to send a cablegram of hearty greetings to the Illuminating Society of America, which was in conference at the same period.

PRESIDENTIAL ADDRESS.

Before delivering his Address, Mr. Shapley asked leave to express his thanks to Councillor Clarke for his kindly remarks about himself, and the ideals which he had set for them of the profession to aim at. Public lighting had vastly improved, but there was still much room for improvement.

STREET LIGHTING.

In the first place, let me thank the members of the Institution for the honour they have conferred upon me by electing me to be their second President. I am not unmindful of the great work which has been done by our first President, Mr. Langlands, especially when one considers the amount which the formation of an Institution of this description entails; and it would not be out of place here to mention our esteemed Hon. Secretary, Mr. Liberty, in this connection. It will be my endeavour to fill the position to the utmost of my ability. To do this I shall need the co-operation of all the members, more especially the members of Council; and I hope at the end of the year, when I hand over, I shall at least have been a worthy successor to my friend Mr. Langlands.

Before giving a description of the street lighting of Leeds as it exists to-day, it may be of some interest to go back a few years, and show how this Department provides for the public need, and also to give a short history of its development.

Referring to our records, I find that in 1883 the Lighting Committee was divided into two sections (the river dividing these), each being responsible for a portion of the lighting of the city. All applications for public lighting were made to the Committee, who visited each case and decided upon the merits of the application. During this period, a special lighting rate was levied, and any property lying more than 250 yards (crow fly) from the nearest public lamps was exempt from the lighting rate. This system, however, was abolished in 1893, and the lighting rate became part of the other rates.

No particular rule as regards spacing appears to have been followed, as side streets up to 80 yards in length were considered sufficiently provided for by fixing a lamp at the junction with the main road. In 1883, there were in the city 8100 street lamps. Flat-flame burners were in use, and to these were fitted a Sugg governor regulated to pass 3½ c.ft. of gas per hour. Of these, 46 were three-light and the rest single burners. Twenty three-light lamps were fixed round the Town Hall, and the remainder at important junctions.

As higher illumination became necessary, the Lighting Superintendent was instructed to make a survey and report what was required to meet the changed conditions. The result was that authority was given to replace all one-light with two-light lamps in main thoroughfares, and in the centre of the city. In May, 1897, the Committee first gave consideration to incandescent lighting, and six lamps were fitted with these burners as an experiment. In August, 1899, further extension of this type of lighting was authorized, and incandescent burners were fitted in important streets in the centre of the city.

Electricity for street lighting was first introduced in Leeds in the year 1900. Ninety-one Brockie-Pell and Johnson Phillips open-type arc lamps in series of ten lamps across 500 volts were installed. These were suspended in Hyde Park carriers fixed on top of the tramway standards; the current being obtained from overhead tramway trolley wires. In 1902, special standards with swan-neck brackets were erected in other thoroughfares and several short streets in the centre of the city. These were fitted with Lewis transformer governor lamps, with separate controls attached to the base of each standard.

This year, incandescent lighting was extended to all other streets within 1 mile radius of the Town Hall. The year 1904 saw this type of lighting generally adopted. The burners were the "C." and "No. 4 Kern" type, fitted with governors to pass 3½ c.ft. per hour.

In 1905, electric lighting in Boar Lane and Briggate was improved by installing "B.T.H." alternating current enclosed arc lamps, fixed on double swan-necked brackets, in the middle of the road. This type was later extended for lighting other main streets. These lamps were suspended from the overhead trolley-wire brackets. The lighting wires were fixed on the back of the trolley-wire arms, controlled by switch fuses, eight lamps to one switch box. Arrangements were made for switching-off alternate lamps at midnight. This was so satisfactory that it was extended to a further 550 lamps.

In June, 1907, the first clock controllers were fitted.

In 1909, centrally-hung electric lamps were introduced into Boar Lane. Two steel cables 7/14 S.W.G., with stretching bolt, were used, suspending "Oriflamme" magazine arc lamps; the rosettes being fixed to the buildings by means of expanding bolts (fig. 1). Later, this system was extended to Briggate, Vicar Lane, and other main thoroughfares. Automatic time switches were installed, two being fitted to each switch point, one to operate "all-night" lamps, and the other to check alternate lamps at midnight.

In 1913, the substitution of inverted for upright burners was commenced. This work was held up on the outbreak of war.

In 1914, a Sub-Committee reported on the advisability of pressure-wave control, and the result was that 200 wave controllers were fixed. The war interfered with the development of this as with the electric lighting. The whole of the arc lamps were removed from the streets and replaced by metal filament lamps of 100 watts, to conform to war-time lighting restrictions. The least said about war-time lighting the better. We, as lighting engineers, would like to forget it; and so we will pass over the years 1914 to 1919.

In December, 1919, the City Council resolved to co-ordinate the work of the Street Lighting and the Gas Department, and I was appointed to take general control. Only one-third of the 16,700 gas lamps were then being lighted, and the illumination from the 700 odd low-power electric lamps was poor; while finances, and the difficulty of obtaining material during the war period, left a few thousand columns without lanterns. You will appreciate that a big problem confronted the Lighting Committee. We were inundated with applications for re-lighting lamps. We had no stocks of lighting appliances, and we had first to settle what the policy of lighting such an important city should be; but owing to the enormous increase in traffic since 1919, considerable alterations in the original scheme have been made.

The lay-out of the city is difficult from a street-lighting standpoint. The industrial portion is very congested, while the population about 2 miles from the centre becomes sparse. There are fifteen main arterial roads radiating from the centre; and there are many important roads connecting these arterial roads, which are also very sparsely populated. I mention this as, although the population of Leeds is about 470,000, the Lighting Department is called upon to light 587 miles of streets, which is 60 miles more than Glasgow, with a population of roughly one-half. In order to demonstrate my point, I have taken several sheets from the Ordnance Survey of Leeds, and mounted them in a frame, so that you may see the lay-out. Holes have been punched to represent every street lamp in the section; and by means of illumination, you will be able to see the actual lighting of this particular portion. The red dots represent electric lamps, the green high-pressure gas, and the remainder low-pressure gas.

We have classified and lighted our roads as follows:

Class A.—Arterial Roads and Tramway Routes.—Clear-type centrally suspended 1000 watt gasfilled lamps with approximate spacing of 40 yds., 24 ft. from ground level to reflector. Additionally, 500 and 300 watt gasfilled lamps (most of which are of the opal type) are suspended from overhead trolley-wire arms, where the property does not admit of centrally suspended lighting. Six-light suspension gas lamps, fitted with clock controllers, on 12 ft. columns, spaced 40 yards central line. Four-light superheated conversion burners in hexagon lamps on 9-ft. columns, spaced 45 yds. central line, also three-light 16-in. modern reflector lamps. We are proceeding to fit all Class A roads with automatic controllers.

Class B.—Important Connecting Thoroughfares and Subsidiary Roads.—Two-light conversion fittings in 16-in. lamps discarded from Class A roads. These are replaced by modern 16-in. reflector lamps as they wear out.

Class C.—Side Streets.—The lighting varies in accordance with their degree of importance. The first lamp in each road is fitted with a two-light conversion burner or modern two-light lamp; the remainder are one light. Two-light lamps are fitted in all special cases.

Class D.—Courts and Closes.—Here, one-light lamps are used. There are many very old lamps, which are gradually being replaced with modern ones.

Class E.—Cross Roads.—500 watt gasfilled centrally suspended electric lamps are generally adopted. In some cases, these are controlled automatically, and in others by the lighter. Thirty cross roads have already been dealt with in this way.

Additionally, we are now fixing special "Caution" or "Danger" lamps approaching all dangerous corners. These are worthy of notice. This classification was instituted mainly as a guide, and, of course, is subject to variation to meet extra-

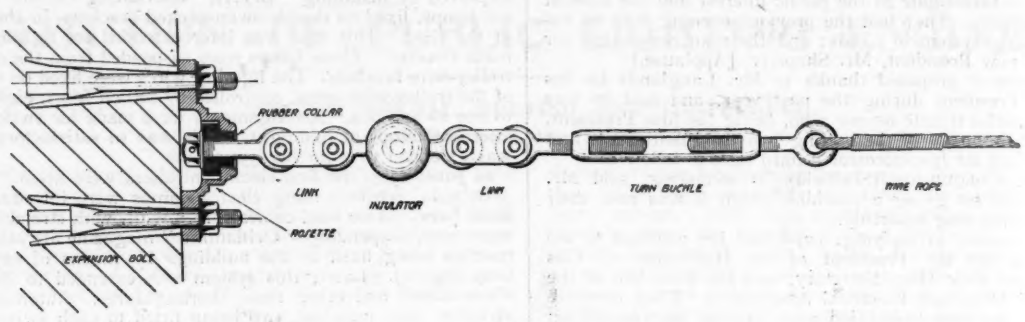


FIG. 1

ordinary conditions. For example, certain connecting thoroughfares are not as much used as others, and therefore would have less consideration.

GAS LAMPS.

We have standardized on 16-in. lamps made to our specification, and they will take up to a three-light No. 2 burner. An interesting point is that there is no iron whatever used in the construction of our lamp. No metals other than copper and brass are employed in its manufacture.

MANTLES.

No. 2 mantles are standard. Considerable care is taken in the selection of size, shape, and manufacture. We were led to this decision as on test they gave better illumination and longer life. As the average number of mantles used per nozzle last year was six, and this figure is being maintained, our decision has been justified.

GAS CONSUMPTION.

Prior to 1920, the gas consumption was calculated on the hours of lighting and rate per burner. All lamps were fitted with governors, and the burners with fixed nipples. The rate of consumption was governed to give 3½ c.ft. per hour. In 1920, all governors were removed, and burners fitted with gas and air adjusters with lock nuts.

To arrive at the gas consumption, we fixed 200 meters in meter base columns to lamps at varying altitudes. These are read by the meter inspectors twice per quarter. The actual gas consumption per burner works out by this method as follows:

	C.Ft.
Universal	5¾
One-light No. 2 mantle	3½
Two-light No. 2 mantle	6
Three-light No. 2 mantle	8
Four-light No. 2 mantle	10
Six-light No. 2 mantle	15

GAS CONTROLLERS.

We have fixed 3000 pressure-wave controllers, all on the three-wave principle. Any number of lights can therefore be checked at midnight. This system has proved very satisfactory, and one man only is employed to attend to failures. The pressure wave is operated from the Dewsbury Road Distribution Station; the pressure on the district being increased by 2 in. and maintained for five minutes. The operations are performed at lighting, midnight, and extinguishing. Each lamplighter tends, on an average, 160 lamps, as against 100 hand-lighted.

We have in use 4900 clock controllers, which are fitted on lamps in Class A and Class B thoroughfares, to obtain as far as possible simultaneous lighting. The number of lamps on the lighter's district on this system averages 140. So far we have obtained very satisfactory working from the controllers; and we only employ one clock repairer for all repairs and adjustments.

ELECTRIC CONTROLLERS.

We employ in the centre of the city a controller which combines three operations in one clock—namely, lighting, checking, and extinguishing. Six of these are in use, controlling 53 lamps, varying in wattage from 300 to 1000. There are also 58 controllers of the on-and-off type, operating 258 lamps, varying from 200 to 300 watts—making the total number of lamps controlled by time switch 303. The remaining 413 lamps are hand-operated from 53 switch boxes.

I shall not discuss the question of the hours of lighting and extinguishing street lamps, as I understand that this matter will be dealt with by our Institution.

MAINTENANCE.

A tower motor derrick is kept for general use, and this is at call at any hour for breakdowns. For general maintenance, four hand derricks, each serving 174 lanterns, are employed, and two men per derrick are responsible for the work.

All steel suspension wires and overhead work are examined annually. Steel cables are put to severe test, and coated with a mixture of graphite and vaseline; care being taken that the whole of the wire is coated. Neglected overhead work is a source of danger to the general public, and systematic examination is very important.

REPAIRS AND FITTINGS.

The Street Lighting Department is under the same roof as the Gas Department's meter repairing and gasfitting shops. A separate staff is therefore unnecessary for street-lighting work. Lamp columns are delivered by our motor wagons, and erected by the mains department. We keep no special tackle for the erection of large columns, as the Tramways Department's tackle is available. Lamp heads are fixed by the fittings department, and repairs to street lanterns are carried out under the supervision of the meter shops staff. These staffs are interchangeable, and can be transferred as the need arises. Thereby economy is effected.

STORES.

The lighter is paid at the gas meter repairing department, and receives his stores weekly. He fills in a form (see Appendix 1), and hands it to the store-keeper. The amount issued is examined by the district inspector, and recorded in the stores register, which gives the quantity issued quarterly to each lighter. As the material used by both departments is identical, no separate stores are required for either. A saving is therefore effected by bulk purchase.

DUTIES AND CONDITIONS OF LAMPLIGHTERS' SERVICE.

Number of hours per week	48
Holidays	14 days
Uniform	One cloth jacket every two years One cap every two years Two duck jackets every two years One overcoat every three years One pair waterproof leggings as required

The lighter inspects all lamps at lighting and extinguishing time, reports all faults daily by stamped postcard to the office (see Appendix 2), cleans all glass once a week, adjusts burners, and renews mantles as required, reports to his inspector once a week, and fills in a time sheet (see Appendix 3), giving particulars of work performed during the week.

SUPERVISION.

The city is divided into five districts, each controlled by an inspector, who is required to be on his district at lighting and extinguishing time. He patrols one run a week with a lighter, is responsible for the efficient lighting of his district, the supervision of repairs, and the pruning of trees, and has to report on alternate days to the head of the Department. One male and one female clerk, and part-time assistants from the Gas Department, do all the clerical work.

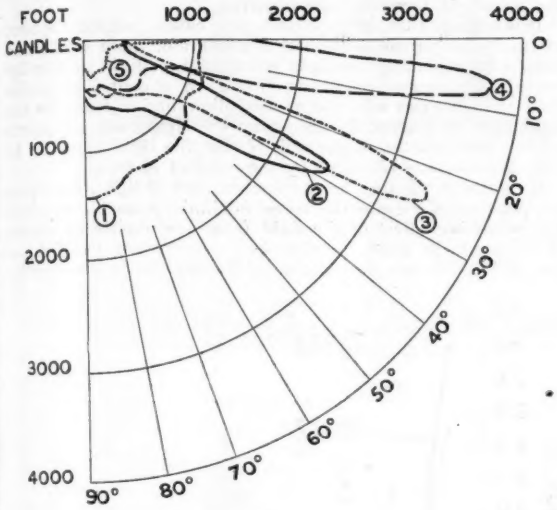
Having taken you over the history and organization of the lighting of Leeds, in order to make the paper of interest to all, it would not be out of place to touch on matters a little more technical.

GOOD ILLUMINATION.

In the choice of lighting, level or uniform density of ground illumination is generally accepted as the ideal. On the other hand, what I should term bright-spot illumination has its supporters; and a strong argument advanced in favour of the latter method of illumination, as compared with level illumination, is the pleasing and decorative effects obtained. Added to this is the definite and stimulating influence a bright source of light has on the user of the road. With level illumination, these important factors are very much less pronounced. The lighting may appear monotonous, lacking in contrasts, and rather gloomy. This comparison is probably more noticeable where the light sources for each system are of equal candle power, and the method of obtaining level illumination is by directional light beams obtained by the use of refractors.

I had some experiments carried out in order to compare the lighting of one of our main thoroughfares, when using bright-spot illumination and level-ground illumination obtained by directional beam lighting; and, frankly, I was disappointed with the results of the latter. In this particular case the greater portion of the re-directed light beams were wasted. There was a brilliant band of illumination half-way up the buildings on both sides of the road. The system of illumina-

tion by directional light beams was tested on the photometer bar; and the following curves of the test are given.



	WITHOUT REFRACTOR	WITH REFRACTOR			
		IDEAL	FILAMENT LOWERED 5/16	1 3/4	3 1/8
MEAN HEMISPHERICAL CANDLE POWER	① 1120	② 990	③ 940	④ 1100	⑤ —
MAXIMUM CANDLE POWER	1430	2500	3400	3700	—
ANGLE OF MAXIMUM CANDLE POWER	90°	28°	25°	5°	ABOVE HORIZONTAL
TYPE OF CURVE	— · — · —	——	— —	— — —	·····

Fig. 2.

Polar curve of the C.P. of a 500-watt lamp without refractor.
Polar curves of the C.P. of a 500-watt lamp with refractor; the position of the lamp to the refractor being slightly varied. These curves clearly show the extreme importance of the correct adjustment of the lamp to the refractor; the slightest variation of the relative position of the lamp to the refractor being sufficient to nullify the desired results.

From the curves, it will be noticed that the concentration of light is confined to a very small compass; and in Curve 4 the candle intensity of the light rays between 5° and 10° below the horizontal is approximately 3½ times the intensity of the lamp used. If you compare the ground illumination curve of the lamp with and without the refractor, it shows graphically that the increase of illumination half-way between the lamps does not compensate for the loss below the lamps. The loss is explained by the concentrated light beams near the horizontal (which are only useful in two directions for street illumination) being made to radiate in all directions. For lighting thoroughfares where the distances between the lamps are necessarily great, one can foresee definite advantages associated with directional beam illumination.

I find it is sometimes an advantage in street lighting to sacrifice illumination for effect; and in Lower Briggate, some gasfilled clear lamps were replaced by opal lamps of the same candle power, with pleasing results. "Even" or "level"

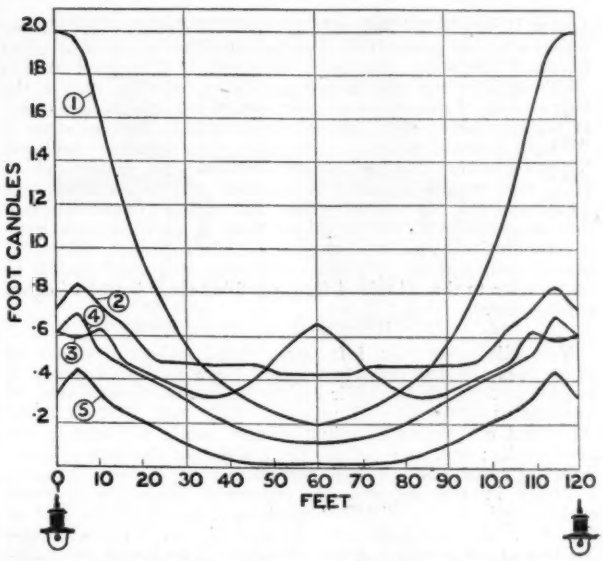


Fig. 3.—Ground Illumination Curves—500-Watt Lamp, with Refractor.

Curve of calculated ground illumination between two lamps, plotted from the polar curves when the lamps fitted with refractors are suspended 27 ft. high and spaced at 120 ft.

ground illumination was a big claim for the particular type of lamps used; but on the street tests made this claim was not substantiated—in fact, for the type of lamp, it was an impossible one, as an inspection of the polar curve (fig. 4) will clearly illustrate. I have included a ground illumination curve for the

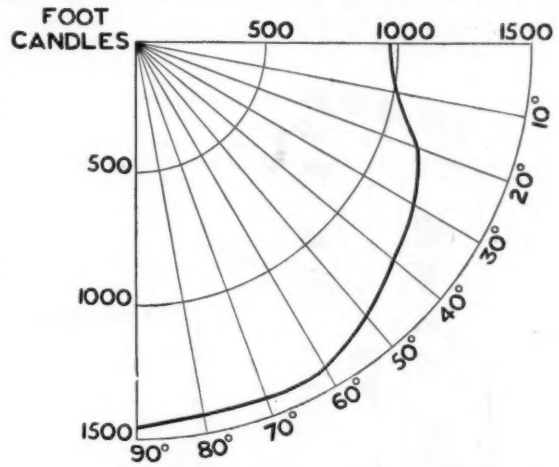


Fig. 4.—Opal Lamp, 500 Watt—Polar Curve.

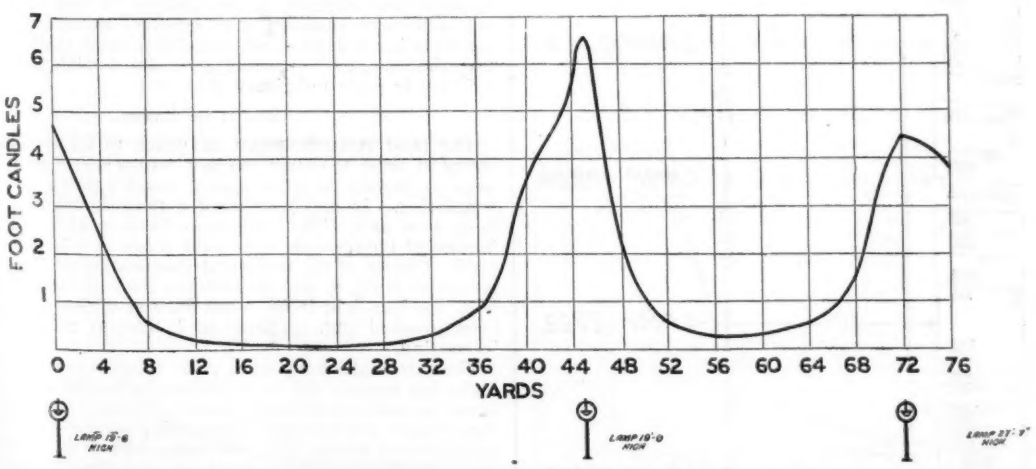


FIG. 5.—ILLUMINATION BETWEEN LAMPS, LOWER BRIGGATE.

Opal Bulbs 500 Watt—Horizontal Plane 3 ft. above ground level.

Lower Briggate lighting (fig. 5); and it is similar in its characteristics to the ground illumination obtained when clear glass filament lamps are the source of light. The good results obtained from the opal lamps are, in my opinion, due to the bigger area of the source of light, which creates an impression of higher candle power, although it is actually less, as some of the light is absorbed by the opal globe. The lights are brilliant, but not glaring; and the intrinsic brilliancy per square inch of globe area is approximately 20 candles. Intensities below this would probably not be so effective. The loss in ground illumination compared with that obtained from a gasfilled clear lamp is comparatively small. The general lighting effect, judged by observation, and not by photometric methods, would appear to be superior to that obtained from gasfilled clear lamps of equal candle power.

The Basis of Best Results.

You will notice that I favour a bright, cheerful source of light as of the first importance; and I am convinced that it is on this factor that the public decide the merits of one system of lighting as compared with another. Judgment of street lighting based on ground illumination only would not lead to the best results; and, as proof of this, I will give you data of some lighting experiments I had carried out in Jackson Avenue, a street in the suburbs. Incandescent lamps by various makers and carrying different numbers of mantles were used in the tests. A plan of the road is attached (fig. 6), showing the position of the lamps and the spacings. The lamps are numbered, for identification. Horizontal illumination tests at 3 ft. above ground level were carried out on each lamp, and the results are graphed (fig. 7).

You will observe that the two-light lamp No. 12,823 is very nearly equal to the three-light lamp No. 12,827 in horizontal illumination at less than 5 yds. from the base of the lamp. Nevertheless, there is no doubt that a street lit with three-light lamps would be better lighted than one with two-light lamps, though the only essential difference would be that one source was brighter than the other. Now, compare the two-light lamp No. 12,823 with the four-light lamp No. 12,833. Here again, any marked difference in ground illumination is confined

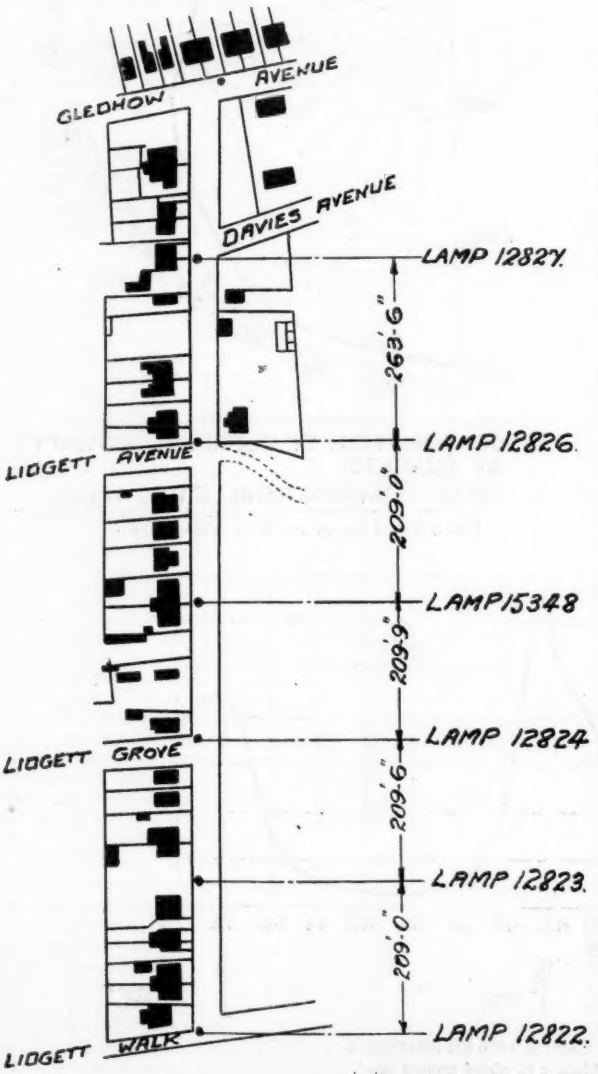


Fig. 6.—Jackson Avenue, Position of Lamps.

to the limited area within 6 yds. radius of the lamp-base when the burner in the lamp is fixed in a particular position; but the four-light lamp is more effective.

It is obvious that, in these particular cases, judging the merits of the lamps on the horizontal illumination, there would be no reason for replacing two-light units by three-light or four-light units; but observation proves that such a course is justified. One of the causes why the ground illumination from the four-light unit, at a short distance from the lamp, was not superior to that from the two-light unit is that the light from the two rear mantles was obscured by the mantles in front.

In lamps containing more than one unit of light, we arrange the position of the mantles so as to eliminate as far as possible any screening effect of the light from one mantle by another. With two-light units interference is completely avoided; and you will notice that the position of the mantles in our two-light

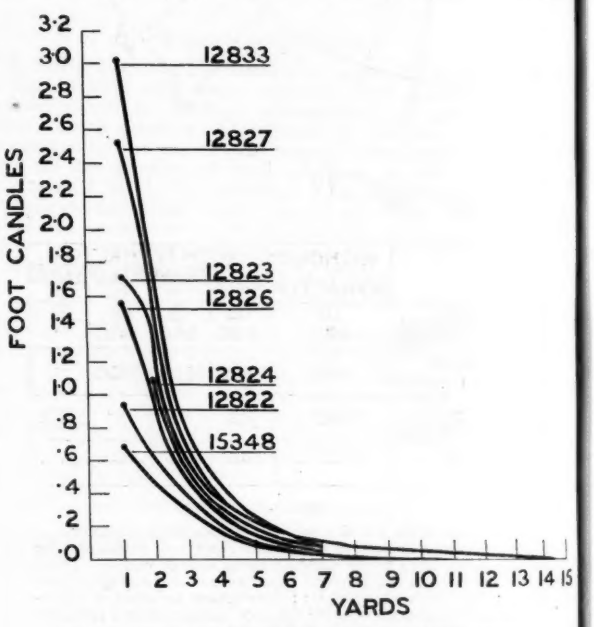


Fig. 7.—Horizontal Illumination Curves, Jackson Avenue (3 ft. above ground level).

street lamps is at right angles to the curb, so that the unrestricted light from each is thrown up and down the curb.

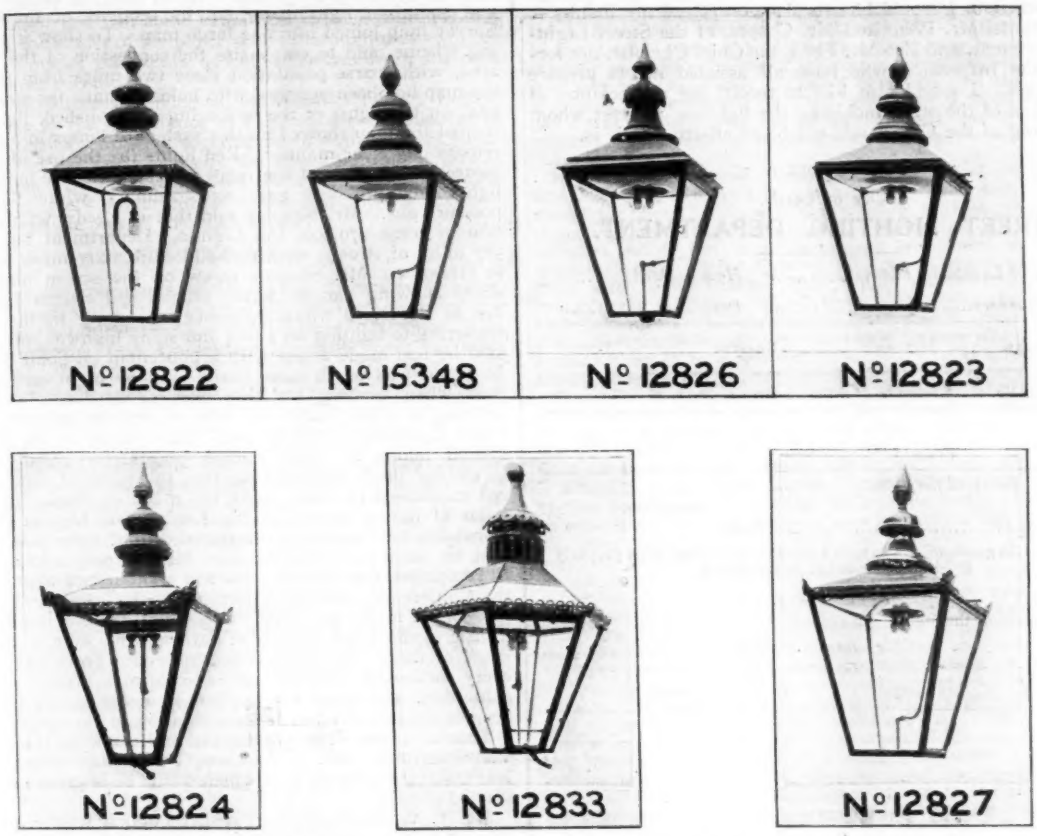
Dazzle Effect.

With respect to the dazzle effect of bright sources of light, this is not a simple question of brilliance, but of contrasts, and depends chiefly on the observer. Personally, I have not experienced dazzle in the ordinary passing observation one gives to a street lamp, even with the highest candle power units. The loss of vision caused by dazzle (say) from the headlights of a motor-car, is due to the fact that the contrast between the brilliancy of the headlights and the surrounding illumination is too great. The same blinding effect is experienced on going from daylight into a darkened room, though the room may appear quite light when the eyes have become accustomed to the gloom. In this case it is the eyes which are unable to adapt themselves to the sudden contrast. In our street lighting the increase and decrease of illumination to and from lamps is not sufficiently contrasting to interfere seriously with vision, except in isolated places where buildings and obstructions cause deep shadows; and, speaking generally, I think dazzle in street lighting is more imaginary than real.

Height of Lamps.

The most suitable height at which to fix certain types of lamps in order to obtain the best results was a problem which arose in respect to some special street lighting we were contemplating. In our experiment a three-light and a four-light lamp were used. The lamps were fixed on 12-ft. columns, and horizontal illumination tests were made at 3 ft. above ground level. Curves of the horizontal illumination of the two lamps are given in fig. 8, and, in addition, the calculated illumination with the four-light lamp, when fixed at different heights, have been graphed (fig. 9), because I thought them particularly interesting.

The three-light lamp on a 12-ft. column appeared to be too high; but because this is an unfamiliar height for this type of lamp, our opinions were prejudiced. Fixed on a column of the same height, the four-light lamp, being a bigger source of light, looked much better. An interesting feature to be noted from the curve (fig. 9) is that the horizontal illumination with the four-light lamp, except within very narrow limits from the base of the lamp, is practically the same for different heights of columns. From the point of view of horizontal illumination



SEE FIGS. 6 AND 7.—STREET LAMPS USED IN JACKSON AVENUE ILLUMINATION TEST.

with lamps of the above type, the height within limits is apparently immaterial. Therefore any decision with respect to the height of fixing would be influenced chiefly by a knowledge of the locality for which they were intended, after giving full consideration to visibility and interference with the line of vision.

TESTING.

In the testing of street lighting the usual standard of comparison is the horizontal illumination; but in my opinion it leaves much to be desired. Horizontal illumination is least influenced by reflected light from buildings and other objects in the vicinity of the lamp, which are factors of sufficient importance to have had some influence in the choosing of the lamp for that particular locality. Pedestrians and any objects in the road are seen chiefly by silhouette and by reflected light from a vertical plane; the reflected light from the horizontal plane playing a part, but not the most important part, in securing visibility. It will be recognized that gradients and the colour of the road surface influence illumination to a considerable extent, and consequently can be considered important factors in the scheme of lighting. In the method of taking horizontal illumination tests, these factors are ignored; the illumination being measured on a white card held in a horizontal position, which is not a true measure of the available illumination.

In taking illumination determinations, we use a lumeter; but its value is very limited, as readings below 0·01 foot-candle are not reliable, though at this illumination definite shadows are produced. In the Jackson Avenue tests observations could only be taken up to a distance of 14 yards from the base of the lamp. This left approximately 45 yards between the lamps where it was impossible to take a reading, though there was distinct illumination in that area; and it would be interesting to know if there is an instrument reliable for readings below 0·01 foot-candle.

I think I have demonstrated that my leaning to a bright, cheerful source of light is justified. I would, however, emphasize that street lighting calls for common sense and initiative, in order to give service to the public, and to provide adequate lighting for personal safety—always having regard to economy.

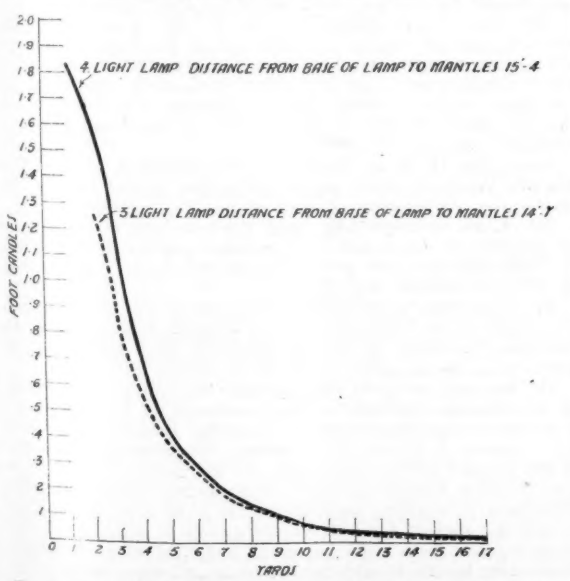

4 LIGHT LAMP DISTANCE FROM BASE OF LAMP TO MANTLES 15'-4
3 LIGHT LAMP DISTANCE FROM BASE OF LAMP TO MANTLES 14'-7
FOOT CANDLES
YARDS

Fig. 8.—Horizontal Illumination Curves (3 ft. above ground level).

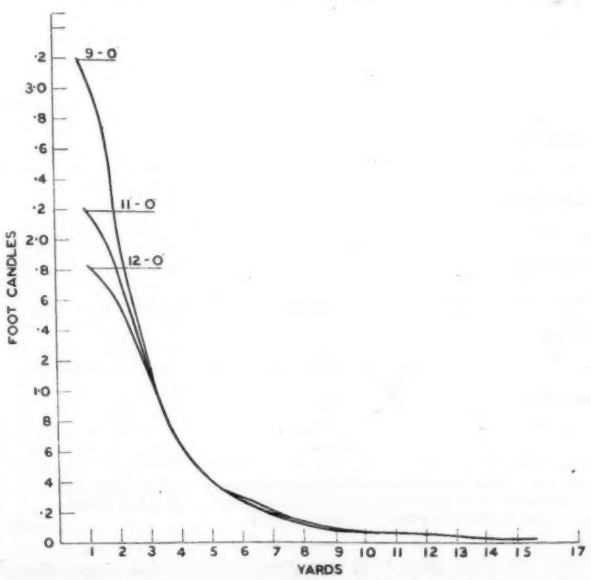


Fig. 9.—Horizontal Illumination Curves, using Columns 12 ft., 11 ft., and 9 ft. High—Four-Light Lamp (3 ft. above ground level).

In conclusion, I would like to place on record my thanks to my assistants, Mr. Went and Mr. Cooper, of the Street Lighting Department, and also Mr. Firth, the Chief Chemist, not forgetting the Inspectors, who have all assisted me to prepare this address. I would also like to record my appreciation of the services of the staff, including the lighters, without whom the lighting of the City would not be as effective as it is.

APPENDIX 1.

City of Leeds.

STREET LIGHTING DEPARTMENT.

Number of Lamps in District..... *How Lighted*.....

No. of Burners..... *Date*.....

Mantles.		Matches.	Nozzles.		
Universal.	No. 2.	Boxes.	Universal.	No. 2.	

Received the above.....
Lamplighter.

Examined by.....*Inspector.*

NOTICE :—No goods will be supplied unless one of these slips properly filled up is handed in to the Stores.

APPENDIX 2.

I have to report the following faults :—

Signature of Lighter.....

Lamp No.	Situation.	Fault.

APPENDIX 3.

City of Leeds.

STREET LIGHTING DEPARTMENT.

LIGHTER'S TIME SHEET.

Name of Lighter.....

Week commencing SATURDAY NOON 19

No. of Lamps attended to this date.....

Day of Week.	Time Occupied Extinguishing. H. M.	Time Occupied Lighting. H. M.	Time Occupied Cleaning. H. M.	Number of Lamps Cleaned	Time Occupied in Other Duties (if any).	If column Number 5 be filled in explain Nature of Duties Performed.	Total Hrs. per Day.
	(1)	(2)	(3)	(4)	(5)		
Saturday .	X		X	X			
Sunday. .							
Monday .							
Tuesday .							
Wednesday							
Thursday .							
Friday . .							
Saturday .		X					
					TOTAL HOURS . . .		

NOTE.—This Time Sheet with details properly filled in must be handed in to Pay Office on receipt of wages. If Time Sheet is not produced, wages will not be paid.

Mr. Shapley helped in the illustration of his observations by the use of a very large map erected across a corner of the hall in a wooden frame, showing the chief portion of the central and suburban lighting system by sections of the Ordnance Survey map joined into one large map. To show it as a lighting scheme, and to emphasize the congestion of the industrial area, with sparse population some two miles from the centre, the map had been punched with holes to mark the street lamps, and, on the lights of the hall being extinguished, lights at the rear of the map showed up this system of lamps in a novel and remarkably clear manner. Red lights (by the use of red paper pasted at the back of the map) indicated electric lamps, green lights high-pressure gas, and ordinary white lights low-pressure gas. Mr. Shapley said that in Leeds, with a population of some 470,000, the Lighting Department had to light 587 miles of streets, which amounted to sixty miles more than in Glasgow. Mr. Shapley threw on the screen nine lantern slides showing various forms of gas and electric lighting in use in Leeds, to which reference was made in the Address. Referring to lighting on a wet and shiny highway, Mr. Shapley said he had made a test with a policeman on point duty, who he found was much more easily seen by night on that shiny road when wearing his blue uniform uncovered than when wearing a white coat. He had drawn the attention of the Chief Constable to the matter. Elaborating on the subject of special lamps to mark danger points, he urged engineers to employ them sparingly, so that the value of their use was not minimized by there being too many of them. In the 587 miles of lighted streets in the Leeds area, he and the Chief Constable had found on investigation that there was justification for only 40 danger lamps. Mr. Shapley asked members to remember that the Address was written two months before the Conference, and that, after seeing the latest devices on exhibition, it might be found that certain of his remarks needed a little modification in view of developments even in that short space of time. He strongly recommended every engineer and every committee chairman or vice-chairman present to see the exhibition, and to see the appliances in the streets which had been made into a form of an exhibition in themselves.

Thanks to the President for his Address were voiced by the VICE-PRESIDENT (Mr. R. Davison, Newcastle), who said there was much information in it which would be of great value when studied closely.

Mr. T. WILKIE (Leicester) said, though it was an unwritten rule that they should not discuss or criticize a presidential address, the members could take the President's suggestions back to their own systems, and put them to the test for their own information and satisfaction. He was glad Mr. Shapley had made public acknowledgment of the help of his assistants in the Department. This was something which engineers were sometimes inclined to forget.

The PRESIDENT, in reply, said one had only to set to work to prepare a paper to find out how many opportunities there were for elaborating and investigating a wide diversity of problems. He had left many things out because he knew the Institution would want many papers, and he hoped many of these points would be dealt with in subsequent papers.

ELECTRIC STREET LIGHTING IN RURAL AREAS.

Mr. EDWARD C. LENNOX then delivered his paper on the above subject, in order to give more time on the following day for discussion of it and the paper to follow. Abstracts from the former and the ensuing discussion are held-over.

Mr. LENNOX, in concluding his paper, said that, like Mr. Shapley, he found that since writing it there had arisen things which, owing to the rapid development of lighting in rural areas and elsewhere, would cause him to modify some of his statements a little, were he to write the paper again.

The PRESIDENT, moving thanks to Mr. Lennox, complimented him on the contribution and on the frank admission that some things—as in his own case—might now require a little modification. He had been particularly struck by the excellent and neat design of the overhead transmission network. Much of that in some parts of the country was a veritable eyesore.

Councillor H. F. A. EDMONDS, Vice-Chairman of the Camberwell Works Committee, seconding the vote of thanks, endorsed the compliments on the neatness of the network.

Mr. LENNOX, responding, said the best way to learn more of an industry was to prepare a technical paper. By suggesting he might modify some points, he did not mean that anything he had put forward was wrong.

The PRESIDENT extended an invitation to Mr. C. F. Botley, President of the Institution of Gas Engineers, and Mr. R. B. Mitchell, President of the Incorporated Municipal Electrical Association, to say a few words to the Conference.

Mr. BOTLEY, who was warmly received, said it was a matter of considerable gratitude to the Institution of Gas Engineers that the younger Institution of Lighting Engineers had seen fit to choose as its second President, Mr. Shapley, a member of the Council of his Institution. It was satisfactory to know that the new Institution meant that the two important public services were working together for the good of public lighting. It was not merely a matter of one's duty to attend such conferences, for those who attended benefited very materially themselves by the interchange of ideas and experiences which they gained from their fellows in the profession. It had been

a great pleasure to listen to Mr. Lennox, especially as he (Mr. Botley) himself had had some experience in such matters; and he felt that the reader of the paper was a thorough master of his subject. Many of the points he could confirm from his own personal experience.

Mr. R. B. MITCHELL endorsed the remarks of Mr. Botley, especially as to the importance of the two great industries of gas and electricity working together for adequate street lighting. Both to gas and electricity the street lighting load was very valuable. Mr. Mitchell added his tribute of appreciation of the President's important Address, and offered his best wishes for the success of the Institution.

THE LUNCHEON.

Following the morning's business, the visitors were entertained to luncheon at the Town Hall, as the guests of the Leeds Gas Committee. Alderman George Ratcliffe, J.P., Chairman of the Gas Committee, presided over a large gathering.

Sir ALBERT BALL (Nottingham) gave the toast of "The City of Leeds," and congratulated the Institution on its choice of a President in the person of Mr. Shapley, a man who was greatly appreciated in the gas industry. Sir Albert said he had been Chairman of a gas undertaking for some twenty years, and had watched Mr. Shapley come to the front as an engineer and as an acknowledged authority—a man who was justly regarded in the North as one of the greatest leaders in the gas industry in particular and in lighting in general. Sir Albert expressed the belief that if everybody put his heart and soul into his work, as had the men who led in the great industries represented at that gathering, there was a greater future before Great Britain than anything in her past.

The LORD MAYOR OF LEEDS (Councillor C. G. Gibson), responding, made reference to the vastness and the wonderful growth of various municipal services in Leeds, touching particularly on the electricity undertaking, but leaving special reference to the gas undertaking to other speakers.

Alderman CHARLES LUPTON (Chairman of the Leeds Corporation Housing, Sites, and Improvements Committee) spoke of the value of good lighting in new houses being erected by public authorities, and also in the streets of those houses. He, as Chairman of the Committee concerned, was "harassed" by people who pointed out the immense value of gas and the horrible faults of electricity—and vice versa. [Laughter.] He had one great comfort in Leeds, in that he could go for guidance to the important Fuel Research Department of the Leeds University, for the fostering of which he must pay large tribute to the help of the gas industry. He believed in the future they would find that this was an authority to which everybody would go for help in matters of lighting and heating.

Councillor JOHN ARNOTT (Lord Mayor-Elect of Leeds), also responding, said Alderman Lupton's Committee had for some time been engaged in extensive housing and street schemes which demanded the best that could be provided in lighting. That Committee also was responsible for a very fine road which would probably be well worth while in a few years' time, and which was typical of progress in recent years in great cities. Councillor Arnott agreed with Sir Albert Ball that the industrial leaders of the past were entitled to much credit for the growth of industry in this country, but tribute should also be paid to the rank and file for their help in building-up the great industries, and for the introduction of many little industries in a city such as Leeds. There had been much achievement in the past, but also great mistakes, in the piling-up of money; and it was the aim of public men to-day to rectify some of these mistakes. He believed there was some success in that direction, and that such meetings of public servants would help. He wished to pay a tribute to the men of the public services which was always due, but not always acknowledged.

Alderman GEORGE RATCLIFFE, J.P. (Chairman of the Leeds Gas Committee), proposing the toast of "The Institution of Public Lighting Engineers," announced apologies for absence from the Lord Mayor of Manchester, the Lord Mayor of Bradford, Sir Charles Wilson, M.P., Sir John Eaglesome (Institute of Transport), and some others. The Institution of Public Lighting Engineers was to be complimented on being able to organize such a conference gathering in the second year of its existence. Leeds was proud of their choice of Mr. Shapley as the new President. He (Alderman Ratcliffe) did not pledge himself to agree with Mr. Shapley all the time, but 90 p.ct. of what he did was so well done that he had nothing but congratulations for him, and he knew he was thereby expressing the sentiments of every member of the Leeds Gas Committee. Alderman Ratcliffe said he had had some little part in bringing Mr. Shapley to Leeds, and he did not think any member of the Committee would hesitate to say that the right thing was done. Such conferences as this one did a great deal of good, and there was splendid work for the members of that Institution to do in the public service. Both gas and electricity must have their place in public lighting, and must work in harmony in the public interest. The gathering, he was sure, would not accuse him of any prejudice if he said, "After all, gas is the thing." The gentlemen of the electrical industry present would know he was speaking only as a Gas Committee Chairman should speak. He was glad to feel that in Leeds the two departments worked in complete harmony. They of the gas industry were out to progress, and to get and to hold all the lighting business they could; and he did not hesitate to say that they would be delighted to see their electrical friends following them up as fast as ever they could.

Mr. SHAPLEY, in replying, thanked, on behalf of the Institution, the Leeds Lighting Committee and the Gas Committee for their ready help in granting facilities for the conference, and thanked the City Council generally for making it possible for those Committees to do so by their co-operation and approval. Street lighting was a great public service, and one that could not justly be measured in terms of money. He would say this without reservation. Street lighting engineers were doing a great work, provided they were doing it properly. Since Sir Charles Wilson, the Chancellor of the Leeds Exchequer, was not present, said Mr. Shapley facetiously, he might tell a secret of high finance. Every year he (Mr. Shapley) carefully prepared estimates of the cost of street lighting, and every year they were religiously cut down by £5000. So that, although at present public lighting in Leeds cost some £9000, Sir Charles had a way of cheapening the bill by these cuts, and it seemed that presently street lighting in Leeds was going to cost nothing. [Laughter.]

Mr. S. B. LANGLANDS (Glasgow), ex-President of the Institution, who also responded, said it was not true to call such conferences mere "joy rides." Without them they would not have the opportunity of getting together and benefiting by interchange of ideas and experiences, which had in all professions been found to be of immeasurable help. Street lighting was one of the things in which there could be no finality. They had to go on from strength to strength and brightness to brightness. This was the purpose of their Institution. He hoped and believed that in days to come the Institution would justly hold the bonds between the rival illuminants. It would be a pleasure in the future to look back upon his having been the Institution's first President.

Councillor E. J. CLARKE (Chairman of the Leeds Lighting Committee) proposed a brief toast to "The Guests," and, in coupling the names of Alderman Waddington (Mayor of Halifax) and Alderman Wilkie (Newcastle), said both these gentlemen were old and tried friends of the gas industry.

Alderman J. H. WADDINGTON (for many years Chairman of the Halifax Gas Committee, and Deputy-Chairman during his Mayoralty), in responding, said that while he was primarily a gas man himself, he rather regretted that so much had been said of gas, and comparatively little of electricity. They must recognize in fairness that the future of lighting in cities and smaller areas must to a great extent be left to the electricity side. To his own mind, there was no competition in the world with electricity for lighting to-day. But when it came to heat and some aspects of power, then he held that gas held a wonderful first place. They who were responsible for the public welfare must have a proper outlook on the situation as it really was, and not as one department or another might wish it to be. They must look to both departments with fair and equitable judgment, and take the best medium for the work in hand.

Alderman A. WILKIE, J.P., Companion of Honour (Chairman of the Newcastle-on-Tyne Lighting Committee), also responded, and said he had made a special effort to attend the meeting, although he should really have been in London in consultation with a Government Department. He had come to Leeds with his Vice-Chairman, Councillor Oates, who was to be the next Lord Mayor of Newcastle, with full permission to invite the conference to Newcastle for next year. He had always been a strong gas man, and he challenged all critics to point to a city better lighted than by the gas lighting of Newcastle. He had been in a great many cities in various parts of the world, but had seen no better. An important factor in such conferences was that they helped the profession to produce the best light at the lowest public cost.

Wednesday, Sept. 16.

The business proceedings were resumed at the Philosophical Hall on Wednesday, Sept. 16, when Mr. Lennox threw on the screen a number of slides illustrating points in his paper.

Prior to discussion, Alderman A. Wilkie and Councillor Oates conveyed the formal invitation to hold the next conference at Newcastle, which was accepted with thanks by the President.

Dr. J. S. THOMAS, B.Sc. (Wales), D.Sc. (Lond.), presented the following paper contributed by the South Metropolitan Gas Company. The paper was illustrated by a considerable number of lantern slides.

PUBLIC LIGHTING BY GAS.

The criticism that "like crabs, producers and distributors of light have approached their objective backwards," would appear to be justified in its application to street lighting. At its beginning public street lighting was instituted to ensure a measure of personal safety to individuals between the hours of sunset and sunrise, and was considered as of equal importance with the provision of adequate police protection. What is the position to-day? A considerable reduction in street illumination was necessitated by the war, and in many cases there has appeared a tendency to regard something approaching the conditions of illumination considered sufficient in those days as adequately satisfying present-day needs. The increasing numbers of burglaries and of street accidents within recent years is evidence of the inadequate general lighting of our streets and thoroughfares. The great increase in the magnitude and speed of street traffic—which would appear to justify the classification of mankind into "the quick and the dead"—calls for a revision of our notions of the adequacy or otherwise of a system of street lighting. Ultimately, the provision of an adequate system resolves itself into a matter of cost. Can it be said that sufficient is spent by our civil authorities in the provision of suitable lighting of streets? Hardly, for whereas in the County of London the police rate levied in 1921-22 amounted to 1s. 3½d., and an equal amount was contributed by a grant from H.M. Exchequer, the rate levied for public lighting during the same period amounted on the average to only 3½d. Surely modern civilization should be prepared to pay at least as much for the security afforded by an adequate system of street lighting as it

is apparently prepared to pay for the police protection which it enjoys.

WHAT ARE THE CRITERIA DETERMINING THE CHARACTER AND EFFICIENCY OF STREET LIGHTING?

Before any system of lighting can be considered as satisfactory, regard must be paid to the following factors:

(1) Adequacy of the illumination provided.
(2) Cost must be a minimum compatible with the provision of efficient service.
(3) The light sources must be steady and constant.
(4) As far as is possible, there must be an absence of "glare."
(5) The system must be such that natural fuel sources are conserved to the utmost.

Considering these points in order, we would remark with regard to (1) that at present there is no agreement as to how efficiency of a street lighting system is to be specified and determined. An International Committee has decreed that luminous flux is to be regarded as the fundamental quantity in the discussion of lighting problems. We consider this to be a retrograde step. Two factors stand out crystal clear in matters connected with lighting systems—the candle-power of the lighting sources and the illumination they produce. It must be realized that the efficiency or inefficiency of any system of lighting is ultimately to be judged by a public unversed in the jargon of terms with which experts would embellish the comparatively simple science of illuminating engineering. The candle-power of the source and its distribution in general suffice for the discussion of any lighting problem. The introduction of the conceptions of luminous flux, lumens bringing with them the factor 4π, the phot, &c., is quite needless, and serves merely to render a subject which is essentially simple unnecessarily obscure. This fact is now being appreciated by the electrical industry, for we read that "it is easier to tell a housewife that she should buy a 150-watt bulb for the kitchen fixture than to say that she should have so many foot-candles on her kitchen work table."

How then is a street lighting scheme to be specified, and its adequacy or inadequacy determined? This matter is extremely controversial, and nothing approaching a consensus of opinion has hitherto been achieved on these extremely important matters. Much has been written and much continues to be *written* on the subject. The last effort would appear to be a long report involving much mathematical argument establishing the result that "in most cases the mid-span horizontal illumination is the one which best determines the over-all quality of the lighting." We suggest that the time has come "to cut the cackle," and that any specification of lighting should take practical considerations into account. Lamps and burners employed in street lighting by gas and electricity are legion, and differ from one another even as the stars in glory. Their characteristic polar distribution curves are infinitely diversified; there is no standard height above ground-level at which they are fixed, nor are they separated by any standard and invariable distances; the optical transparency of the air is different at different periods; the roads, streets, and pavements to be illuminated are widely different in character; and there is no single manner in which the illumination provided is utilized. For some purposes, illumination distributed over a vertical plane is desired, for others horizontal illumination alone is required, while yet again vision in the streets may be aided by the absence of illumination upon the surface viewed, which then appears as a dark object silhouetted against a bright background. The specification of a lighting system in terms of illumination of a vertical surface would appear to be definitely ruled out by the fact that the illumination of a vertical surface between two sources of light cannot, by the very nature of things, be the sum of the respective illuminations afforded by the two sources. A lighting system, we suggest, is best specified in terms of the curve of radial distribution of the light of the source. All other particulars referring to the illumination provided by the system can then be readily calculated. Practical experience with varied sources and the character of the illumination they provide will then afford information useful alike to the contractor and the contracting council or committee requiring their streets to be illuminated.

Most valuable work has been done by Trotter* in the matter of the classification of systems of street illumination. This is based upon a minimum horizontal illumination afforded at a height of 3 ft. 3 in. above street level; and it is worthy of note in connection with our present contention, that, though the various systems providing the illumination were erected to a candle-power specification, this mode of specification succeeded in providing systems of street lighting in which the illumination was found to be suitable for the character of the traffic in the respective streets. Trotter's classification of street illuminations is as shown in Table I.

Roads where the minimum horizontal illumination is not less than 0·025 foot-candle would be first-rate main lines of thoroughfares. Auxiliary and relief roads would have a minimum horizontal illumination of between 0·015 and 0·025 foot-candle, while in side and unimportant streets the minimum horizontal illumination would be below 0·015 foot-candle. In

* Illuminating Engineering Society, 1913, Vol. VI., p. 25.

TABLE I.

Class.	Minimum Horizontal Illumination (Foot-Candle.)
Undesignated.	Below 0·01
A	Not less than 0·01
B	,, ,, 0·025
C	,, ,, 0·04
D	,, ,, 0·06
E	,, ,, 0·10

most thoroughfares, constituting about 80 p.ct. of public roads, such as country roads, the horizontal illumination is below 0·01 foot-candle; the lighting sources then serving merely as beacons indicating the direction of the road, the position of the curb, &c. There can be no question that the rapid growth of fast-moving traffic within recent years will shortly compel a revision of our standards of adequate street illumination. Mr. H. T. Harrison has made an interesting analysis of the street lighting in over 119 country and metropolitan boroughs and urban districts where municipal electricity undertakings exist. The data collected relate to all classes of streets and roads; reference being made to 5675 miles of street lighted by 190,078 gas lamps, and 2392 miles lighted by 70,616 electric lamps. It will be noticed that even in places where municipal electricity undertakings exist, about 75 p.ct. of the street lighting is carried out by gas. Mr. Harrison's figures show that, on the average, while electric street lamps are spaced 180 ft. apart, or 30 to the mile, gas lamps are spaced 157 ft. apart, equivalent to 34 to the mile. Calculation shows that, assuming the average lamp employed under such conditions to be one of 100-candle power, the lighting of the great majority of our streets—95 p.ct.—can only be classed as inferior beacon lighting. This deplorable state of affairs calls for an immediate remedy by local authorities.

In the matter of costs of street lighting, Mr. Harrison concludes that this is not materially affected by the use of gas or electricity or by the use of both forms of illuminants. This conclusion is hardly borne out by an analysis of figures relating to the lighting of streets within the boroughs of South London included in the area of supply of gas by the South Metropolitan Gas Company. (Table II.)

TABLE II.

Borough.	Miles of Street.	Number of Public Lamps. Gas.	Number of Public Lamps. Electricity.	Cost of Lighting per Mile per Annum 1921—23.		Lighting Rate Levied, Half Year Ended Sept. 30, 1925.	
				£		d.	
Bermondsey	61	1,029	459	364	Average £233	2·27	Average 2·03d.
Woolwich	81	1,698	566	146		2·20	
Battersea	74	468	946	178		1·83	
Southwark	65	2,250	281	243		1·82	
Camberwell	121	4,418	..	119	Average £132	1·77	Average 1·62d.
Wandsworth	195	2,971	..	133		1·70	
Lewisham	127	2,246	..	90		1·60	
Deptford	51	1,947	..	179		1·60	
Greenwich	62	2,053	..	153		1·58	
Lambeth	154	4,194	..	117		1·37	
Total	991	23,274	2,252	..		..	

It will be noticed that in the last six boroughs in which the street lighting is entirely by gas, the rate levied is in every case less than the rate levied in the first four boroughs in which street lighting is shared by gas and electricity. The average levied in the boroughs having streets entirely illuminated by gas is only four-fifths of that levied in the remaining boroughs. The average cost of street lighting per mile per annum indicates a decreased cost of about £100 in favour of street lighting entirely by gas.

While on the question of the cost of public lighting by gas, we would refer to the very great economies that may be effected by the replacement of the older types of gas burners by more modern and efficient ones. This may be illustrated by the data contained in Table III., referring to improvements which resulted prior to the war consequent upon the adoption of improved methods of illumination by town gas within the area supplied by the South Metropolitan Gas Company.

TABLE III.

Year.	Number of Public Lamps.	Gas Consumption. Millions C.Ft. per Annum.	Equivalent Candle Power.	Candle Power per C.Ft. of Gas Consumed per Hour.	Remarks.
1899	20,998	478	280,000	2·5	Flat flame burners throughout district
1902	21,800	359	1,270,000	14·0	Upright incandescent burners throughout district
1913	24,713	371·5	1,700,000	19·0	8000 upright burners replaced by inverted

TABLE IV.

Class of Burner.	No. of Burners.		Hourly Consumption. (Therm).		Total Cost of Gas per Annum (1s. 2d. per Therm less 15 P.Ct).		Average Number of Mantles Used per Lamp per Annum.		Total Cost of Mantles per Annum.		Total Cost. Gas and Mantles.	
	Upright.	Inverted.	Upright.	Inverted.	Upright.	Inverted.	Upright.	Inverted.	Upright.	Inverted.	Upright.	Inverted.
					£	£			£	£	£	£
No. 3 Kern	7001	..	0·0188	..	19,205	..	18·1	..	2904	..	22,109	..
1-Light Inverted	..	2324	..	0·0100	..	3,462	..	2·8	..	129	..	3,591
2-Light Inverted	..	4677	..	0·0200	..	13,561	..	5·2	..	481	..	14,042
5 Ft. S.I.	652	..	0·0250	..	2,286	..	16·6	..	311	..	2,597	..
3-Light Inverted	..	950	..	0·0300	..	4,034	..	9·9	..	186	..	4,220
10 Ft. S.I.	786	..	0·0500	..	5,533	..	13·2	..	418	..	5,951	..
5-Light Inverted	..	488	..	0·0500	..	3,383	..	11·8	..	114	..	3,497
Total.	8439	8439	..	..	27,024	24,440	..	..	3633	910	30,657	25,350

It will be seen that, whereas in 1899 the streets of South London were illuminated with the equivalent of 280,000 candles, in 1902 the value had increased to 1,270,000 candles with an increase of only 4 p.ct. in the number of lamps and a decrease of approximately 20 p.ct. in the total annual consumption of gas in the lamps. The extension of the system of lighting by inverted incandescent burners was temporarily postponed during the war; but the work has within recent years been taken up again, and still greater efficiencies and reduction of costs have been realized by the more general use of the inverted burner, especially of the preheated cluster type. The economy to be effected by the use of the preheated type of inverted cluster burner is best seen by reference to the data contained in the accompanying Table IV., which are taken from the report to the City and County of Newcastle-on-Tyne by the Lighting Superintendent, Mr. R. Davison, on the adoption of the inverted burner in place of the upright (1921).

The annual savings in cost of gas and of mantles are seen to be respectively £2584 and £2723; making a total saving of £5307. The total cost of the conversion amounted to £2431, which was recovered in six months. Additional economies effected by the introduction of the inverted preheated type of burner which are not taken into account in the table arise owing to reduced costs of spare burner parts and the abolition of glass globes enclosing the burners.

Particulars relating to the respective lighting efficiencies of various lighting units employed by the South Metropolitan Gas Company are contained in the sequel.

Passing to the third of the points referred to, we would remark that by the operation of the Gas Regulation Act, 1920, under which gas companies are at liberty to declare the calorific value of the gas to be supplied by them and are thereafter to maintain constancy of quality of their supply, the matter of public lighting by gas has been considerably simplified. The declared calorific value of the gas supplied by the South Metropoli an Gas Company is 560 B.Th.U. per c.ft. In Leeds it is 470 B.Th.U. per c.ft. The point all-important to the present discussion is tha', whatever the declared calorific value of the gas supplied, obligation is laid upon the undertaking to see that burners in which the gas is consumed are such that the gas is burned so as to render an efficient duty. Gas and burner constitute a unit; and they must be suitably adjusted one to the other, so that the consumpion of gas results in the performance of a definite and predetermined duty. This possibility of standardizing gas consuming appliances is one of the advantages accruing to the gas industry under the Gas Regulation Act, and sets the matter of public lighting by gas upon an exact quantitative basis—a condition of affairs which, we would contend, is eminently satisfactory both to the public lighting authorities and to the suppliers of gas. The half-hearted attempts which were once made to cope with changes in the composition and properties of town gas by the provision of devices for the adjustment of the rate of consumption of gas by the burner and of the air induced cannot be regarded as having been very successful. Such devices are now unnecessary, as the burners can once and for all be suitably designed in the first place for use with gas of the declared calorific value—that is to say, gas burners can now be of as fixed and definite a construction as electric lamps. This has for long been the policy adopted by the South Metropolitan Gas Company; and experience has shown that burners for street lighting, without gas or air adjustments, can be designed to yield a duty deviating little from a pre-ascertained value, provided the calorific value of the gas does not depart from the declared calorific value by more than 25 B.Th.U. Under these conditions, the endeavour of the South Metropolitan Gas Company to achieve a satisfactory system of public lighting by gas resolves itself into (1) the experimental determination and specification of a burner suitable for use under the extreme conditions met with in its subsequent use in the streets; (2) the assembling of component parts for the bulk manufacture of such standardized burner; and (3) the verification from time to time of the duty rendered by burners manufactured in bulk. The forms and dimensions of all components of the lamps are specified, and the bulk manufacture of standardized burners reduces itself merely to the assemblage of carefully-gauged parts.

Table V. serves to give particulars relating to the respective efficiencies of various types of street lighting units comprising burner, lantern, reflector, &c., employed by the South Metropolitan Gas Company.

The upright burner affords a more uniform illumination of the street than the inverted type of burner. The latter type, however, has a luminous efficiency about three times that of the upright type. The ideal arrangement would therefore appear to be to employ a lamp in which the high luminous efficiency of the inverted burner is combined with some form of directional reflector whereby a smaller value of the diversity factor may be obtained with this type of lamp. This is done in the "Metro" directional reflector lamp in triangular lantern, in which the high efficiency of 53 candle-hours per centi-therm is combined with a diversity factor of only 30. Here we would point out that no type of reflector—whether directional or not, or whether used with gas or electric lamps—can in the slightest increase the actual candle-power of the luminous source employed. This will be seen from the table by comparing the

TABLE V.

Lamp.	Arrangement.		Hourly Consumption.		Mean Candle Power.			Roadway Illumination (Horizontal) Produced.		
	Height above Roadway.	Spacing.	C.Ft.	Therm.	Per C.Ft. per Hour.	Per Centi-Therm per Hour.	Mean Candle Power.	Foot-Candles. Maximum.	Foot-Candles. Minimum.	Diversity Factor.
	Ft. In.									
Kern No. 2 in "Conversion" lantern	10 1	50 yds. (staggered)	2·64	0·0150	11·4	20·3	30	0·107	0·00179	60
No. 4 "Metro" inverted in 14-in. "Windsor" lantern	10 5	50 ,,	4·0	0·0224	30·5	54·5	122	0·80	0 00564	142
1-lt. No. 2 horizontal feed inverted preheated burner in 14 in. "Windsor" lantern	10 8	50 ,,	2·46	0 0138	28·8	51·4	71	0·435	0·00283	154
3-lt. ditto in 16 in. "Windsor" lantern	10 9	50 ,,	6·5	0·0364	32·0	57·1	208	1·42	0·00787	181
4-lt. ditto in "South London" lantern	12 3	50 ,,	9·1	0·0510	33·4	59·6	304	1·54	0·0139	111
8-lt. ditto in "South London" refuge lantern	15 7	..	18·0	0·101	35 9	64·1	646	..	..	..
16-lt. ditto in "South London" refuge lantern	15 7	..	33·1	0·185	37·0	66·0	1224	..	..	..
1500 c.p. high-pressure lamp	19 0	85 ft.	28·4	0·159	54·6	97·5	1550	2·55	0·646	3·94
No. 4 "Metro" burner with "Metro" directional reflector in triangular lantern	10 9	50 yds.	4·4	0·0246	29·7	53·0	132	0·51	0·017	30

candle-powers of the directional and non-directional types of No. 4 "Metro" lamps. A reflector serves to *direct* the light in desirable directions only. However many images may be seen in the mirrors employed for this purpose, the candle-power of the source, including all these images, is unaltered. When, therefore, an authority on the directional type of reflector states that "the effect is a varying number of images, and thus multiplication varies from 7 to 12 times depending on the dimensions of the light source, and the increase of candle power varies from 5 to 8 for the same reason," the statement, to say the least, is extremely misleading. The effect upon the diversity factor of employing burners at greater heights and closer together is seen in the case of the high-pressure lamps mounted at a height of 19 ft., and spaced 85 ft. apart. The diversity factor in this case is about 4. Attention may also be directed to the increase of efficiency of the inverted cluster type of lamp as the number of units in the cluster is increased. Thus, whereas the efficiency of the 1-light cluster is about 51 candle-hours per centi-therm, the efficiency of the 16-light cluster is 66 candle-hours per centi-therm.

Discussion.

Mr. L. GASTER (National Safety First Council, and Illuminating Engineering Society), opening the discussion, referred to the speaker's declaration that the number of road accidents by day was actually larger than by night. It seemed to him that Dr. Thomas was hardly a statistician; for although the number might be greater, one had to take into consideration the vast difference between the amount of road traffic by day than by night, the vastly greater number of pedestrians about the streets by day, and the considerable difference between the hours of daytime activity and those of the night. In proportion the number of accidents by night was very much greater than by day, and without a doubt inadequate lighting, or unscientific lighting methods, had a great deal to do with it. Everybody should be very grateful for all that the South Metropolitan Gas Company had done, and were still doing, for public lighting; and one of the chief aims of that Institution, he claimed, was to get more lighting of the streets and roads, and, as far as possible, at less cost.

Mr. A. C. CRAMB, M.I.E.E. (Borough Electrical Engineer of Croydon), remarked that the authors of the paper seemed to suggest that it was only a question of money. That was not the whole of the story. Dr. Thomas seemed to say, "Give us the money, and we will give you the light;" but the duty of a public lighting authority was to give the utmost lighting at the minimum cost. They could not merely demand money, with rates and taxes at the present-day level. They had been shown photographs of some very good lighting in South London; but there still remained a large proportion of important streets in South London which were not lighted as could be desired. He had every sympathy with the Gas Company in their efforts to give better lighting for the money available, and wished to express his thanks for the excellent paper.

Mr. S. B. LANGLANDS, J.P. (Lighting Superintendent of Glasgow), said there was a tremendous fascination in figures; but figures could sometimes be misleading, and he thought the question of the figures of day and night accidents was a case in point. Dr. Thomas, of course, knew quite well that there was a tremendous difference between the volume of daytime and night-time traffic. Dr. Thomas, he noticed, had a little tilt in his paper against the term "lumen." In retaliation, he would like to ask who created the term "therm"? Again, Dr. Thomas gave figures of cost; but did not say what value in illumination was given. He hoped Dr. Thomas would forgive him for his few remarks. They were not meant as captious criticism. He wanted to thank him very greatly for the splendid work he and the South Metropolitan Gas Company were doing, had done, and would continue to do. He wanted to emphasize the absolute necessity for the Institution tackling, in conjunction with the Ministry of Transport, the whole problem of better lighting of the roads of the country. There certainly was a need for co-ordination. For instance, the idea of linking-up control as between Edinburgh and Glasgow was rather like trying to mix oil and water. Yet what was to happen in regard to control of lighting on a great highway between these two cities?

Mr. T. NEWTON (Lighting Superintendent, Hereford) said the authors of the paper were to be heartily congratulated. When Dr. Thomas spoke of the matter of lighting being largely a problem of cost, it was generally understood, one assumed, that this implied that there should be the best possible results for the money which could be expended. Although there had been some criticism on this point, he thought they should give Dr. Thomas credit for that intention. In dealing with this question of lighting, so far as many older boroughs were concerned, one had to take conditions very largely as they existed. If one started *de novo* one might consider spacing of lamps and medium of light more closely; but in older places lamp standards, &c., were already there, and must be taken into account; and one had to get the best possible results out of them. With regard to lighting and accidents, the latter could occur sometimes in very well lighted places. In his district they had a case in point only a week or two ago. The accident was just underneath a lamp. It was not the light that was at fault—there was a bridge, and there had also been some intoxicating liquor. The driver of a motor vehicle mistook the opening of the bridge, and ran into the support. At the inquest the Coroner questioned as to whether lights and shadows had anything to do with the misjudgment of the bridge opening; but when the scene of the accident was inspected, it was agreed to be one of the best-lighted places in the town. Yet it was very easy for people to say this accident was due to ineffective lighting. Personally, he thought that in many places, if they could get back to pre-war lighting, they would make a step forward. There were plenty of places to-day which had not got lighting as good as they had before the war. All of them in the profession were engaged in trying to improve public lighting; and some of them had to do it by improving the units on the existing columns. It was very much to be desired that there should be some standard table of illumination to which they could all work. It was rather disappointing to know that there was no present means of measuring minute illumination between lamp columns; and it was to be hoped something of that sort would be forthcoming very soon.

Bailie DERVEY (Vice-Chairman of the Greenock Lighting Committee), in adding his congratulations to Dr. Thomas on the value of the paper, said an important point to remember, in his view, was that the greatest essential was good lighting rather than the question of getting that which cost least. In his town recently, for a certain street, the Lighting Superintendent gave the Committee a plan for gas lighting and a plan for electric lighting. The gas was materially cheaper, both in regard to illumination and maintenance. But there was a section in the Town Council who argued for the best lighting, even if it was not the cheapest; and they thought the electricity was the best. However, the party of economy won the day, and they got for this street the gas lighting, for the sake of the little financial saving. A little later the question came up again in regard to another road, and this time electricity won the day. Since then there had been attempts to have the other street converted to electricity. The business of a lighting engineer was to get the very best light he could. He should submit plans for the very best lighting available. If his Committee would not accept it, the blame should be on them, and not on the superintendent.

Mr. J. B. BALMFORTH (Gas Engineer to the Bingley District Council) said that, though he was a gas engineer, with regard to public lighting he was neither pro-gas nor pro-electric. He was responsible for good street lighting. It was a very fine thing that gas and electrical engineers could meet in that Institution on common ground and discuss the merits and demerits of illumination. In regard to remarks as to "lumen" and "therm," it seemed to him that it would be well if in future papers the authors would endeavour to give terms of efficiency in numerals which both gas and electrical men could use in common, so that they could effect better ideas of comparison for mutual consideration.

Mr. R. DAVISON (Lighting Superintendent, Newcastle-on-Tyne) added his congratulations to the authors of the paper. He was very pleased that Dr. Thomas had brought to the notice of the Institution the fact that it was not impossible to get results, and sometimes at less cost. That was what they were all out for. One speaker seemed to suggest that they would only get what they paid for. His own experience hardly agreed with that. In Newcastle, at one time they were paying £5000 a year and getting less lighting for it. Dr. Thomas had done a service to the Institution by showing that they could get good light for less money. In Newcastle they had some 9000 gas lamps and about 6000 electric lamps, so he thought he could claim to be impartial.

Mr. H. H. DAVIES (Public Lighting Superintendent, Chesterfield) said in Table II. Dr. Thomas gave costs of street lighting and proportion of rates levied in various London boroughs. It would be interesting if it were possible to get the proportion of rates levied in respect of gas and electric street lighting, maintenance, cleaning, &c., separately. He believed most municipalities had such analyses. He thought that by comparison with the value of lighting the cost as between gas and electricity was a minor matter in connection with public lighting. In his town they had an area of 50 square miles to light; and the cost was only 3d. in the pound on the rates. The President had on the previous day mentioned the handicap of lighting estimates prepared by the engineer being cut down when they came before the local authority, in order to make the rates "tie up." That was one of the great difficulties. Public lighting was a public necessity, and must be paid for as such. Lighting engineers had to make the most they could of what money they could get. There was no doubt that their results were largely a matter of £.s.d. In regard to directional lamps, he was glad the South Metropolitan Gas Company were taking this matter up. They would find that directional lighting had advantages, and also disadvantages. In Chesterfield they were persuaded to try directional lighting on some electric lamps. It was on some six or eight lamps in an important part of the town. In some ways they proved very valuable, but in others they were a source of trouble. After the first few days the Chief Constable complained that the lighting was going to be the cause of accidents. Those lamps had been erected for a very definite purpose, and changing them to directional lighting rendered them unsuitable for that purpose. Their object was largely to light the loading of tramcars and traffic passing during such loading. Then, again, they had the railway people complaining that directional lighting in the streets outside the station caused difficulty for the traffic in and out of the station.

The PRESIDENT said probably Mr. Davies' trouble with directional lamps was due to the position of the filament. This could be altered. In Leeds they had had some trouble with four-way directional beam lighting at first; but they altered it, and he was now perfectly satisfied with it.

Mr. J. STEWART (Glasgow) was entirely in sympathy with Dr. Thomas when he said in the paper that a lighting system was best specified in terms of the curve of radial distribution of the light of the source. In regard to the measurements in foot-candles in Table V. of the paper, Mr. Stewart said he had attended, on behalf of that Institution, some of the meetings of the British Engineering Standards Association's Sub-Committee who had been considering the matter of a specification for a portable photometer. The draft specification had now been printed, and had been passed by the senior Committee. He hoped it would be available for members of the Institution by the time of the next annual meeting. He supposed the manufacturers would be working on the lines of that specification now. One point that was made clear in drawing up the specification was that the reading of less than 0·001 foot-candles could not be guaranteed, and he was agreeably surprised to find how far down into the decimals the minimum foot-candles had been got in Dr. Thomas' paper. It was very good reading to get the minimum foot-candles down to 0·00179. He would like to know what instrument was used, if any. He would also like to know what were the

plates used, and the exposures given, for the very fine photographs given to illustrate the paper, and especially in regard to the two comparative photographs of high-pressure and low-pressure lighting in figs. 17 and 18.

The PRESIDENT, in closing the discussion, said he was delighted they had had such excellent discussions on both papers at the meeting. It was hoped that the Institution would in due course be in a position to print their papers and discussions in the form of "Transactions." Records of the discussions were being made and kept with that end in view. He hoped that in all their discussions they would not be anti-gas or anti-electric or pro-either, but that they would simply be out for the best they could get in public lighting.

Dr. THOMAS, replying to the discussion, said at the outset that any congratulations which were offered on the paper should not be offered personally to himself, but were due primarily to the Distribution Department of the South Metropolitan Gas Company, and particularly to Dr. Carpenter, the President, to Mr. Dean Chandler, and Mr. E. M. Severn. There had been a mass of comment and criticism, and he hardly knew quite where to begin in reply. Mr. Gaster had commented on the comparison of daylight and night accidents. Of course, the point Mr. Gaster raised he quite admitted, and he was in agreement with him in his contention that more night illumination was required. The one point he was out to make in this regard was that in any consideration of what street accidents at night were due to, the thing that was of first consequence in public safety was the amount of illumination. It was a most difficult thing to say absolutely that "there is the cause of that." It was by no means such a cut-and-dried affair, and he thought if the matter were put to the Ministry of Transport merely in that way they would probably turn down the case for more illumination. If the Institution were able to stir up the authorities of the country to provide more illumination, they would have done a very great work. In reply to Mr. Cramb, he took it to be thoroughly understood that public lighting engineers were doing their best to provide the maximum lighting efficiency, but that they were absolutely handicapped by the amount of money available. The public by now had become sufficiently educated to pay for proper police protection, but were not yet sufficiently educated to pay for proper lighting protection. It was not a case of gas *versus* electricity, but one of getting the necessary money, and good light would be provided. Where the money was not sufficient, the lighting efficiency would have to be of smaller degree. In some places the lighting efficiency was so low that they had not an instrument to measure it. He was not prepared to admit that some of the lighting in South London was inadequate for the money which was provided for that service. In regard to the references to lumens, the point to be borne in mind in lighting streets was that they were concerned in lighting flat surfaces, whereas in the mind of the average man the factor was concerned with spherical things. Electrical theory had been kept back by some twenty or thirty years because they chose a unit which was analogous to the lumen. The average man would never understand what was meant by lumen, and it was the average man who had to use and pay for the lighting. As to the little quip about the therm, that was not an invention of the South Metropolitan Gas Company. It was suggested in 1881 by Sir Arthur Hooker, and was undoubtedly a very satisfactory unit of measurement. In regard to Mr. Stewart and his remarks on the portable photometer and measurement of footcandles, he did not suppose the average gas or electricity undertaking would go to the expense of what must necessarily be a very elaborate and rather costly instrument. He was glad that a portable photometer to enable them to get down to the low illumination was to be available. It would certainly be valuable, though he maintained that for public lighting they should have an efficiency of illumination which would not need any such instrument. With regard to the figures on Table V., questioned by Mr. Stewart, they were obtained by division, and would stand the ordinary photometric measurement.

THE NEW OFFICERS AND COUNCIL.

The HON. SECRETARY (Mr. W. J. Liberty) presented the report of the Scrutineers (Messrs. Dervey, of Greenock, and Barnes, of Todmorden) on the election, showing the list of new officers and Council to be as follows:

President: Mr. C. S. Shapley, Leeds.

Vice-President: Mr. R. Davison, Newcastle-on-Tyne.

Hon. Treasurer: Mr. E. M. Severn, South Metropolitan Gas Company.

Hon. Secretary: Mr. W. J. Liberty, City of London.

Editor: Mr. E. J. Stewart, Glasgow.

Council: Messrs. R. Beveridge (Edinburgh), W. H. Chapman (London), J. F. Colquhoun (Sheffield), H. M. Davies (Chesterfield), S. B. Langlands (Glasgow), R. Mason (Birmingham), I. H. Massey (Oldham), M. H. Wardle (Liverpool), and T. Wilkie (Leicester).

VOTE OF THANKS.

On the motion of Mr. R. DAVISON (Vice-President), a hearty vote of thanks was accorded the members of the Leeds Corporation, the Lighting Committee, and the Gas Committee, coupling with it the names of the Lord Mayor and the Chairmen of the Committees, for the hospitality given the members during the Conference.

On the proposition of Mr. R. B. MITCHELL (Municipal Electrical Association), hearty thanks were awarded the President of the Institution (Mr. C. S. Shapley) for the manner in which he had presided over the Conference.

On the motion of Mr. A. C. CRAMB, seconded by Mr. C. F. BOTLEY, thanks were awarded the officers and Council for their past year's work; and on Mr. BOTLEY'S proposition warm thanks were also accorded the authors and readers of the addresses and papers.

This closed the business portion of the Conference, and most of the members adjourned to the exhibition of lighting appliances at the Town Hall.

THE EXHIBITION.

The exhibition, which was held in the large main hall of the Town Hall, was augmented usefully, for both exhibitors and visitors, by the fact that, by arrangement with the Leeds Lighting Department, a considerable number of street sections had been fitted with various lamps and other appliances, so that these could be seen in actual work in ordinary—not special display—service.

The exhibitors were: A. E. Podmoré & Co., London, showing various gas lamps and fittings; the Ramie Company, gas mantles for street lighting; W. Parkinson & Co., London and Birmingham, general gas lighting appliances; Wm. Edgar, Hammersmith, gas street lighting lanterns and fittings; George Bray & Co., Ltd., Leeds, Bray burners for street gas lighting and domestic use; Falk, Stadelmann, & Co., Ltd., London, "Veritas" mantles, conversion sets and burners for street lighting, and "Veritas-Alpha" hard-silk flexible incandescent mantles for vibration and shock resistance; the Automatic Light Controlling Company, Ltd., Bournemouth, featuring "Gunfire" street lighting controllers; Evered & Co., Smethwick, gas lighting lanterns, globes, &c.; Pontifex & Co., London, gas lamps, gauges, &c.; Foster & Pullen, Ltd., Bradford, lanterns, superheater burners (one to ten lights) acetylene torches, by-pass cocks, &c.; and tools; Horstmann Gear Company, Ltd., controls for gas and electric lamps; Alder & Mackay, Ltd., Edinburgh, "A. & M." controllers for gas lamps, as in use on over 3000 Leeds lamps, and the "Edinburgh" street lantern; Metropolitan Gas Meters, Ltd., showing gas meters and street lighting controls, including a working model of the latter on a larger scale for examination in detail; William Sugg & Co., Ltd., Westminster, automatically controlled (Metropolitan Meters) "Rochester" suspension lamps and 15-light and 10-light Littleton lamps; C. H. Kempton & Co., Ltd., London, gas lamps, conversion sets, and burners; the City of Leeds Street Lighting Department, types of lanterns, both gas and electric, and burners; and the Halifax Corporation Gas Department, also showing types of burners in use.

Messrs. Donald Macpherson & Co., Ltd., Manchester, exhibited paints, varnishes, and enamels for gas, electric, and tramway standards.

The following additional particulars of the exhibits have been forwarded by the firms named.

Messrs. A. E. Podmore & Co. (of Charles Street, Hatton Garden, London) had on exhibition samples of their "Bournemouth" high-power lamps similar to those used for the lighting of the Poole main road; a globe lamp fitted with "Gunning" controller; high-candle power lamp fitted with outside controlling taps, which may be supplied with two, three, five, seven, or more burners. By means of the device mentioned some of the units in this lamp may be turned off when the full lighting power is not required. The firm also had on show their well-known "Ivex" dust-proof burner.

The exhibit of Messrs. Foster & Pullen, Ltd., of Avil Works, Bradford, included a representative selection of their square, circular, and hexagonal lanterns, as well as inverted lamps, superheated burners (one to ten light) so arranged as to permit of close inspection of the detail of construction. Other exhibits were acetylene torches, bye-pass cocks, frogs, and accessories. The firm were allotted a section of Kirkstall Road for demonstration purposes. This gave them an opportunity of showing several types of their lanterns in actual use. These lanterns were actuated, by agreement with the Horstmann Gear Company, Ltd., by type 3A/UNI "Newbridge" detachable controllers of the latest pattern, which embody a device which renders it unnecessary to dismantle the gas cock periodically for lubrication purposes.

Messrs. Wm. Edgar, of Blenheim Works, Hammersmith, had a well-equipped stand on which was displayed a variety of square street lanterns, including the "Caxton P," with superheated inverted all-brass burner; the "Caxton A," with specially designed wind-proof head for fixing in exposed positions; the "Caxton H" (the original lantern of the "Caxton" series), and the "Caxton S.S.," designed for use in small side streets, alleyways, &c. The "Caxton P" is largely employed in the improved lighting programme being undertaken by the City of Leeds. In addition to these was shown a range of four different models of conversion sets for modernizing existing square lanterns. Any type or make of old lantern can be fitted with one or the other of these sets. Other interesting exhibits were the "Eclipse" shop lamps of the suspension type, made to accommodate from three to ten medium mantles on superheated burners. Another "Eclipse" lamp was shown fitted with a midnight controlling apparatus, whereby a predetermined number of mantles may be shut off automatically at any given time. An entirely new street-lighting unit was also on view—the "Eclipse" lamp arranged for column lighting. This is made with a strong cast-iron base housing a controller. The supporting arms from the base go through the

reflecting shade, and are fixed at their upper end to the body of the lamp. This is a very effective and efficient model. Various types of controlling apparatus, cast bases, wrought-iron fitments and burners were shown.

The products of Messrs. William Sugg & Co., Ltd., of Westminster, were early before the notice of those attending the conference. On the line of route to the conference hall were fitted their well-known "Rochester" suspension lamps—a slightly modified form of the "Littleton." Five of the 10-light and ten of the 15-light sizes were to be seen here, and all were fitted with the Metropolitan Meter Company's automatic controller. A further example of the 15-light lamp was exhibited in the Victoria Hall. There is a rapidly growing tendency to employ the "Rochester" lamps in harps or swan-necks upon columns for ordinary street-lighting purposes in place of the square glazed type of lamps. It is found that the former cost far less for maintenance, and also that they give a much better curve of light. Many important cities have already adopted them. In the Victoria Hall was shown another exhibit of great interest to public lighting engineers—a 10-light upright "Littleton" lamp with cast-iron base accommodating a controller as fitted to the suspension lamps. Just as these latter are being widely adopted for ordinary street lighting, so is the upright "Littleton" being used very largely for the lighting of important thoroughfares, parades, promenades, and road junctions. It is a handsome lamp and one for which it is claimed that it gives high-pressure candle power for low-pressure upkeep cost. All of the lamps referred to are made with superheated clusters of small mantles—the most efficient and the most economical principle. Messrs. Sugg & Co. make a big feature of conversion sets which enable existing lamps to be modernized in this way; thus affecting a big saving in consumption, or, alternatively, a big increase of light.

REFRACTORY MATERIALS.

[A Fuller Report of the Proceedings will be published next week.]

The Autumn Meeting of the Refractory Materials Section of the Ceramic Society, held on Sept. 16 and 17, again brought a goodly gathering of the members, though some were only able to attend part of the time. The chair was occupied by the President, Mr. Frank West. The programme was not so extensive as on many previous occasions, and this circumstance afforded a somewhat unusual opportunity, of which advantage was taken, for brisk discussion of each of the papers, none of which had to be taken as read, as unfortunately has been the case at times.

The first item on the programme was a "Preliminary Note on the Influence of Foreign Matter on the Thermal Expansion and Transformation of Silica," by J. F. L. Wood, H. S. Houldsworth, and Prof. J. W. Cobb, of the Fuel Department at Leeds University. In the absence of the authors, it was read by Mr. Dale. The preliminary experiments described in the note were made on a Welsh quartzite from Bwlchgwyn, and the specimens formed of ground material with added substances were fired at cone 9, cone 12, and cone 14 for two hours before examination, the results being compared with those obtained from a standard test-piece containing 2 p.ct. of lime. The reversible thermal expansion, true specific gravity, porosity, and refractoriness were determined. It was significant that in only a few cases were the differences in specific gravity sufficient to indicate even a small effect on the degree of conversion of the quartz, while the reversible thermal expansion of the samples showed marked changes in some instances. The additions were boric acid, potassium carbonate, potassium chloride, ferric oxide, &c. The amount added was 2 p.ct. in each case, but 5 p.ct. and 10 p.ct. of boric acid were also tried. Ground Deepcar ganister with 5 p.ct. boric acid behaved like the Welsh quartzite. The investigation is being continued; and Dr. Mellor announced that the full paper would be given at the next meeting of the Section, to be held in Cornwall in the spring of 1926.

The next paper, by C. E. Moore, on "Some Changes taking place in the Low-Temperature Burning of Stourbridge Fireclay. II.," contains, as did a previous communication from Mr. Moore on the same subject, records of valuable experimental work. One cannot help regretting that the good grain should be mixed with so much chaff in the form of lengthy references to a theory which, to say the least, has failed to exert any attraction on the ablest experts in scientific ceramics. In addition to the phenomena observed during the progress of heating, Mr. Moore also reports the results of quenching, solubility, dehydration and rehydration tests. In the discussion which ensued, no one besides Mr. Moore said a word in favour of the hexite-pentite theory, but there was ample testimony to the value of Mr. Moore's experimental work.

The paper on "Refractories for the Pottery Industries," by W. Emery, is an interesting and suggestive review of the subject, and need not be taken as concerning the pottery industries only. This will be appreciated when it is pointed out that among the topics touched on are the refractories used in the construction of both intermittent and continuous ovens and kilns. It is true that the ovens and kilns employed for firing pottery ware differ from those used in other industries, but there are general principles which apply equally to various modes of heat treatment. The value of Mr. Emery's résumé is enhanced by references to personal experiences.

Mr. W. J. Rees contributed "A Further Note on the Storage of Silica Refractories," which should serve to emphasize the warning previously given as to the danger of leaving silica refractories unprotected from weather influences.

"A Note on Some Cases of 'Spalling' in Silica Gas Retorts," also by Mr. Rees, has, of course, special interest for the gas industry. The spalling in question was associated with the presence of scurf, which was exceptionally difficult to remove from the retort. The scurf penetrated the wall of the retort. The silica in the immediate neighbourhood of the deposited carbon was found to contain much more iron oxide than the other parts of the retort wall. Investigation indicated as the probable cause of these unusual occurrences the local accumulation of iron oxide in the silica of the retorts, and the action of this concentrated iron oxide in decomposing carbon monoxide. Hence it is advisable as far as may be practicable to prevent such concentrations of iron oxide.

The remaining paper, by S. R. Hind, on "Tunnel Kilns for Burning Firebricks, Part I.," reviewed the characteristics desirable in tunnel kilns for the purpose mentioned, comparing them with other types of continuous kilns. The data from which opinions can be formed are to be published later.

The President's Address included an interesting résumé of the progress of the Ceramic Society, more particularly as regards the subject of refractory materials, and with special reference to modern developments in the gas industry.

WILL THORNE: HIS BOOK.*

THIS is a very readable book by our friend, Will Thorne, M.P., who in his time has played many parts in industrial life, and particularly in the world of labour. It is a picture in unvarnished language; it gives us facts from the life of a man who commenced at the lowest rung of the ladder of life, and ascended to one of the topmost in his sphere. In parts it is a record of the debasing conditions in which formerly many of the unskilled workers in our industries entered upon life's work. Many of them lived amid the squalor and gloom of the drab quarters of our great industrial cities. For them in those days there was little sunshine. Will Thorne was born in October, 1857; and therefore it is not too early to wish him "Many happy returns of the day." There were in his early years few educational facilities for such as him; and he had, through the death of his father, to take his first job when only six years of age. As we read on, we find the youth meeting in his employment with many vicissitudes, and we are not sure that for him, in view of his life's work, this was not good training, for it enabled him to obtain a breadth of view of the varied operations of industries which is not given to every man. All this happened before he became connected with the gas industry, which he joined by obtaining employment at the Saltley Gas-Works of the Birmingham Corporation, where commenced, as we shall presently show, his work in assisting to bring about the amelioration of the conditions which existed in those now far-off days in many places in the industry. If we wished seriously to criticize the author over the material in his book, we should, in the first place, and in a friendly way, do so for not categorically pointing out the marvellous changes which have taken place in the conditions of those who, like him, entered upon life's work in lowly circumstances. The standard of those conditions has been—as Mr. Thorne will be the first to admit—considerably raised, from both the educational and the industrial points of view; and we are quite prepared to say that the old trade unions, as founded by such men as Will Thorne, have been the means of helping to promote the more salutary conditions. During the past half century, the educational facilities in this country have been vastly improved; and if we looked through the industries (and we think we may claim this particularly for the gas industry), it is found that substantial provision has been made for the intellectual, the recreative, and the personal welfare of the workers. Thus it is that the state of affairs which contributes to the sorry story found in this book of the early life and environment of our friend, has been completely changed, to the advantage not only of the workers, but of the undertakings and industries which they serve.

The narrative tells us of how Sunday labour in gas-works came to be largely abolished, how this led up to the formation of the Gas Workers' Union, and later on how, through the experiences of the author and of other men, the eight-hour day was introduced in gas-works. It was at the Saltley Gas-Works, when Mr. Henry Hack was Engineer, that Will Thorne

* "My Life's Battles," by Will Thorne, M.P. London: George Newnes, Ltd. Price, 3s. 6d.

obtained his experience of working twelve hours a day in the retort-houses. Let us see what the author says about this:

> Ordinarily the work was agonizing. Twelve hours a day in heat and steam and exposed to draughts. Bending and straining the back and arms, taxing the muscles until they became numb, but the change-over multiplied all this. We would start work at six o'clock on a Sunday morning, the last day in a two-week shift, and work the twenty-four hours right through until six o'clock on Monday morning. Every extra hour after the first twelve seemed like a month; and when these twenty-four hour stretches came to an end, I used to be absolutely exhausted in body and mind. It would be well into the middle of next week before I began to feel normal again after these long stretches of inhuman labour.

Then came the regenerative furnace; and regarding this the author says that it made working conditions even more unbearable than the old—it was almost impossible to stand for long on the floor in front of it. What, however, we miss here is an acknowledgment on the part of Mr. Thorne that the conditions in retort-houses have been considerably modified through progressive invention and improvement, and that they are distinctly more tolerable than they were in the olden days. While talking of improvements, it may as well be said that there is another point which is not acknowledged in the book; and it is this: In the early days of the introduction of machinery into retort-houses, those who led the men were strongly opposed to it on the ground that the greater facility which was given to carrying out the operations of carbonization had the effect of depriving men of employment. Even in those days the doctrine of ca'canny was in vogue; and the working of the machinery was impeded, and therefore maximum efficiency was not realized. Of course, time has shown that such procedure and such doctrine are entirely opposed to the welfare of the workers. It was not seen in those days by the leaders of the men that the lower the cost of production, the cheaper the product could be sold, and therefore the greater the demand for it—thus providing more employment. This has been proved over and over again in industry; and the developments that have been made (which were so strongly opposed in those early days) have been the means of providing more employment. We should have been pleased if Mr. Thorne had mentioned and laid emphasis on these facts.

However, reverting to the question of the abolition of Sunday labour, the author of the book had, in those far-off times, the felicity of seeing his work accomplished through persistently agitating for it. Those were the days when Mr. Joseph Chamberlain was Chairman of the Birmingham Corporation Gas Committee; and after the matter had been considered by the Committee, following various interviews which a deputation of the men had with the Chief Engineer of the Saltley Works and the Resident Engineer, Mr. Shoubridge (not "Schoolbred," as mentioned in the book), the cessation of Sunday work was conceded. Says the author: "My heart throbbed with excitement as we waited for him (the Chief Engineer) to speak; and I exulted when he announced: 'The Gas Committee have decided to do away with Sunday work from 6 a.m. to 6 p.m. No payment will be made for Sundays.'" This is described as an "eventful victory;" and its influence quickly spread through the country. It was largely owing to the dispute which arose over this matter that first thoughts came of forming a union of gas workers. The book tells us of how all this came about. Later on Mr. Thorne migrated to London; and there he obtained his first job at the Old Kent Road Station of the South Metropolitan Gas Company. At that time, to use his own words: "I never dreamt that within ten years I would be in conflict with the great Mr. (later Sir) George Livesey and his Company, as a result of a 'vicious' system which he tried to introduce in 1889." The strike which took place over this—one of the biggest and most interesting of the period—occurred almost immediately after the formation of the Gas Workers' Union in 1889. But the birth of the Union was subsequent to the transfer by the author of his services to the Beckton Gas-Works; and it was there that he and others secured an enthusiastic following which resulted in the founding of the organization. Incidentally it is noticed that, in the early days of the Union, there was an attempt to form an alliance with the miners, with the view of stopping supplies of coal to gas-works, should occasion require in (so it was mistakenly thought) the interests of the gas workers. This shows the militant spirit that prevailed in those days. Had that alliance been brought about, and had it been perpetuated, it would have given rise to a condition of things which would perhaps have had an effect opposite to that anticipated by those who sought for it. It can be conceived that, could the miners have exercised any effective control at any time in relation to the supply of gas, the lot of the gas workers would not to-day have been so comfortable as it is.

Naturally the story of the dispute which led to the great strike in South London (in which Mr. Thorne was a prominent figure) receives considerable attention in the biographical pages. One of the bones of contention was what was then known as the "bonus scheme" which was introduced at the South Metropolitan Company's works. It is unnecessary to review what the author has to say in this connection. But a reference may be made to the results. He states: "Very few of the old hands ever returned to the employ of the South Metropolitan Gas Company. It was a costly and unsuccessful strike; the Union paying-out over £20,000 in strike pay and other expenditure. We had the satisfaction, however, of knowing that it cost the Company in the neighbourhood of a quarter of a million pounds." Why there should be "satisfaction" over this considerable waste of money in carrying on a contest which proved abortive entirely passes our comprehension. We should have been better pleased with the volume had our friend brought the story of the issues of those eventful days up to the present time—had he told his readers how the "bonus scheme" of thirty-five years ago has grown into a co-partnership scheme which has produced more material and personal advantages to the workers of that and other companies than any of the socialistic methods of securing more wealth for the workers have ever done, or are likely to do. Mr. Thorne does not mention that the workers of the South Metropolitan Gas Company to-day are the possessors of a considerable amount of capital in the Company, solely through that scheme against which the young Gas Workers' Union fought three-and-a-half decades ago. It is such beneficent schemes as this that the Trade Unions should strongly support and urge. But their attitude is well illustrated by what took place at the Trade Union Congress only a couple of weeks ago, when workers were advised not to tolerate these insidious devices of the employers to bring about their undoing. We can well imagine men under the co-partnership system who have been enabled through it to make some provision for old age laughing in the faces of those extremists who talk such unadulterated nonsense, as if the schemes were subversive instead of constructive; as if they caused the men harm, instead of enriching them, and giving them a broader outlook on life. To call such a scheme "vicious" is a serious misuse of the term.

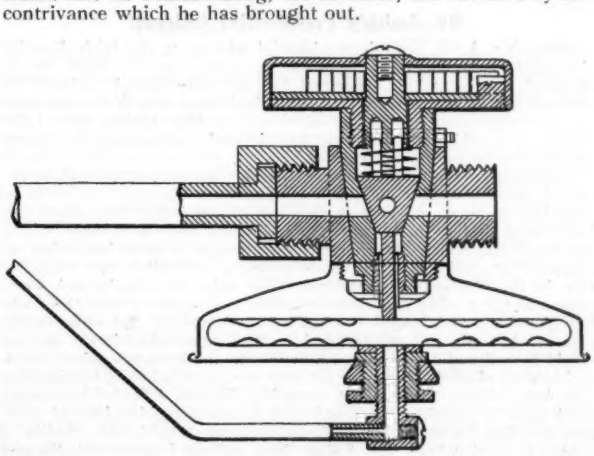
We cannot follow all the interesting historical information there is in the book. Much more appears dealing with labour affairs in the gas industry, but nothing is found relating to the current industrial position. There are also a great number of personal reminiscences. The author does not pretend to any literary ability; but he presents the volume as a plain, straightforward statement of his recollections and impressions. In it there are a few minor errors in respect of facts, but too insignificant to call for special mention. The book has a foreword by the Rt. Hon. J. R. Clynes, M.P., who was also at one time closely identified in official capacity with the Gas Workers' Union. The volume is well printed, and neatly bound; and we think many gas men will possess themselves of a copy, with a view to obtaining first-hand light on matters which have had an important bearing upon the evolution of labour policy in the gas industry.

AN ALL-SAFE GAS TAP.

Coping with Untoward Incident.

At No. 20, St. Paul's Churchyard—the offices of Anti-Waste Appliances, Ltd.—a demonstration was given us last week of an all-safe gas tap designed to render impossible any accidental leakage of gas, and, therefore, to eliminate waste and prevent possible explosion or poisoning.

With the ordinary tap of (say) a hotplate burner, the flame, if in a low simmering position, is liable to be extinguished by a strong draught. If this is unnoticed, the accumulation of unburnt gas may result in unpleasant consequences. The same thing, of course, applies to the oven burners, or to those of gas fires and geysers—in fact, of any gas-consuming appliance. Again, hotplate burners may be extinguished by the boiling-over of liquids; and—though such occurrences are fortunately rare—children have been known to turn-on gas taps, and leave them unlighted in the "on" position. All these hazards, stated Mr. G. Schlusselburg, the inventor, are obviated by the contrivance which he has brought out.



New "All-Safe" Gas Tap.

The new tap, which is turned on by a circular motion, is very simple in its construction. Around the flames of the burner is fixed a tube of small bore, which is closed at one end. The shape and position of this tube depend on the type of burner on which it is fitted. For example, with ring burners the tube is circular, while with griller burners it consists simply of a straight piece. The other end of the tube is carried to the bottom of the tap itself, where it is attached. When the gas is lighted, the flame heats the surrounding tube, thereby causing the air inside to expand. The pressure produced forces upward a diaphragm which is fitted at the bottom of the tap. The upward movement of the diaphragm raises a pin and allows the gas to pass to the burner. Until the diaphragm is raised, the tap, which is maintained in tension by a spring, has to be held open; but the whole operation takes only a second or so. If, now, the flame is extinguished, the air in the small tube contracts, the pressure becomes normal, the diaphragm returns to its former position, and the tap, being in tension, automatically closes.

The general neatness of design of the new device can be seen in the accompanying diagram. The invention has not yet been put on the market in any country, and has been seen only by leading British gas engineers, who state that from a technical and a practical point of view they advocate its use. The patent has been secured by Anti-Waste Appliances, Ltd., who will manufacture the taps in England.

CORRESPONDENCE.

[We are not responsible for opinions expressed by Correspondents.]

Tar v. Bitumen.

SIR,—The correspondence which has been going on for some little time under the above heading has afforded me much interest and amusement. My excuse for "butting-in" in the argument is that I consider neither of the correspondents has mentioned what to my mind is the most vital thing in road construction—*i.e.*, the safety of people using the roads.

As I take it that "Motorist" owns a motor car, might I suggest to him to travel on a bitumen road after a shower of rain, at (say) 35 m.p.h., and apply his brakes. I am afraid, even if he possesses the latest four-wheel brakes, he will be subjected to an alarming skid. During the course of a year, I cover a large mileage in a fairly high powered car, and have always enjoyed driving at night; but nowadays, with the knowledge that there are odd stretches of bitumen road dotted about here and there—maybe round the next corner—driving on a wet night affords me anything but pleasure. I think all motorists appreciate a bitumen surface when it is dry, but when it is wet they have little control over their front wheels when turning, or the car when braking. Also, from my experience, a bitumen surface holds moisture longer than do other types of road. It is essential that the surface of a road should be equally satisfactory in a wet or dry condition, particularly so with our British climate.

Regarding tar for road construction, I like this type of road the best, provided the tar is correctly applied. Tar, correctly used, to my mind, furnishes the best all-round surface.

I am sorry that a large proportion of our surveyors, or people who are entrusted with road construction, suffer from the delusion that, if they procure a machine for laying a nice dressing of tar on the surface of the road, they have done all that is necessary—apart from throwing some large granite chippings on it. My car happens to be of a light colour; and tar marks show! On roads so laid, I have to go dead slow to avoid throwing tar on the car from the wheels; and when inconsiderate drivers pass me at any speed at all, I get splashed with tar and hit by chippings—an unpleasant experience. Why should people who apply tar in this way always choose that delightful time about Whitsuntide at which to commit their nuisance? Is it because people usually have had their cars newly painted about that time, for the summer?

I should like to take the liberty of suggesting to Mr. Herbert W. Robinson that the best advertisement the Midland Tar Distillers can have for their product is the satisfaction of road users; and to gain this end, they should educate those responsible for the laying of the tar in the correct way of using it. My experience is that, if a good proportion of sand is added to the chippings, the wet tar nuisance ceases, and a good road is the result. Motorists, however, are not the only users of roads; and perhaps "Motorist" would appreciate a few opinions on bitumen from the owners of horses.

I might say the only interest I have in bitumen or tar is that I use the roads.

"SAFETY FIRST."

Sept. 18, 1925.

Mr. Smith's Presidential Address.

SIR,—Mr. J. D. Smith's presidential address to the Irish Association of Gas Managers, as reported in your issue for Sept. 16, is of great interest to all concerned in your most useful national industry; but as one who has probably had more practical experience of low-temperature carbonization than has Mr. Smith, may I be permitted to add a few points he has omitted, and attempt to correct one or two (in my opinion) errors?

Commencing with his comments on the low-temperature plant reported upon last year by the Fuel Research Board, I think it is only fair to point out that to the best of my belief that plant was built to a design made some fifteen years ago, with only minor modifications, which incorporated no attempt at heat insulation or recuperation, and had no adequate means of controlling the temperature in the combustion chambers. The coke was discharged from retorts to the cooling chambers by hand, and removed from the cooling chambers and loaded into railway wagons by the same crude means. In a plant of modern design, the heat required in the setting would be reduced by at least one-half, and the labour required for a carbonizing plant dealing with 250 tons per day (including loading the coke into railway wagons, but assuming the coal delivered into overhead bunkers) would not exceed 5 or 6 men per shift, instead of 8 men per shift for 50 tons daily throughput, as stated by Mr. Smith.

May I mention here, Mr. Editor, how entirely I agree with the remarks you make in the second paragraph of your leading article in the same issue on Mr. Smith's comments on "destructive criticism." Criticism is good for all industries; but if it is successfully to withstand searching investigation, it must be composed of the whole truth, and state all the facts—not merely such portions as best suit the policy of the critic.

Turning now to the products of low-temperature carbonization, it must be borne in mind that low-temperature coke is not like either gas-works coke or high-temperature coke-oven coke. It is as different from each as they are from one another. It serves a different purpose, and will have a different market. Personally, I do not consider it a strong competitor of either. Low-temperature tar bears an even smaller likeness to gas tar or coke-oven tar than the cokes do to one another, and the uses for it are even wider apart than the uses for the cokes. Where, therefore, is the competition? Again, low-temperature gas has ingredients in it which are far too valuable to be used for heating the retorts or enriching town gas. These ingredients should first be separated, which can easily be done commercially, and only the residual gas used for heating the setting. Provided the setting is properly designed and insulated, such residual gas is ample for the purpose unless exceptionally poor coal is being carbonized.

To my mind, no one who has really studied the technical and commercial aspect of low-temperature carbonization would ever dream of installing a low-temperature plant in this country for the specific purpose of making town gas, in the light of present knowledge. A town gas-works is primarily interested in the manufacture and distribution of gas, with coke, tar, and ammonia as bye-products. The business of a low-temperature plant is essentially to make and supply a different coke, with a different tar, a different motor spirit (not benzole), and a small quantity of a different gas as saleable bye-products. Regarding raw material, no low-temperature man who understands his business would consider for one moment the purchase of good gas coal or coal suitable for ordinary coke ovens. In the first place, they are too expensive, and, secondly, the products obtained from such coals in a low-temperature plant are neither as useful nor as marketable as those produced from well-washed second-grade slacks.

No Sir! It is my firm belief that low-temperature plants will never be serious competitors of either gas-works or high-temperature coke ovens. Far from it. There is a need and a market for the products of all three processes. Neither do I believe that low-temperature carbonization will ever be the "gold mine" that some advocates try to make out. I have, however, good reason to think that the commercial results attendant on a properly-designed and carefully-managed low-temperature plant will be equal to any obtained from high-temperature coke ovens, provided the plants are situated, as the coke ovens usually are, on the door-step of the colliery supplying the raw material. Low-temperature plants will without doubt prove of national service, if only by converting second-class slacks, so difficult to sell at remunerative prices, into readily marketable commodities having a sale value 50 p.ct. to 100 p.ct. in excess of the raw material from which they are made.

PHILIP C. POPE.

The Engineers' Club,
Coventry Street, London, W. 1.
Sept. 19, 1925.

Town-Gas Engines for Power.

SIR,—May we be permitted to tender you our best thanks for including the article "Town Gas for Power" in the current issue of the "GAS JOURNAL;" also for your excellent leader in the "Editorial Notes." We trust we shall see good results from these special efforts in urging the extended use of town gas for power. All our District Branch Managers throughout the United Kingdom are paying attention to this matter at the present time; and we hope to be able at a later date to inform you of definite and advantageous results.

We are pleased to note your reference to the special efforts made by our electrical rivals in all directions. If Gas Companies will only put forward similar efforts, and make every use of gas-engine manufacturers by calling in their aid wherever possible, we ourselves have no doubt that beneficial results will follow to the mutual advantage of the gas undertakings and the manufacturers of gas engines.

CROSSLEY BROTHERS, LTD.
J. G. WALTHEW, Sales Manager.

Openshaw, Manchester,
Sept. 21, 1925.

MISCELLANEOUS NEWS.

GAS REGULATION ACT APPLICATIONS.

The following notices have appeared in the "London Gazette" regarding applications to the Board of Trade under the Act.

SPECIAL ORDERS.

Leatherhead Gas and Lighting Company.

The Company intend to apply for an Order under section 10 of the Act, to authorize the Company to raise new capital, contract for supply and purchase of gas in bulk, and for other purposes.

Sidmouth Urban District Council.

To authorize the Council to supply gas in scheduled areas, to borrow money, and for other purposes.

DECLARATION OF CALORIFIC VALUE.

Great Driffield Urban District Council.—500 B.Th.U. per c.ft. (Oct. 1.)

CARDIFF GASLIGHT AND COKE COMPANY.

Advertising Ammonium Sulphate.

Practical agriculturists in particular, and cottage gardeners in general, were very much interested in the fine trade stand of the Cardiff Gaslight and Coke Company at the Cowbridge Show held on Wednesday, Sept. 16. They exhibited a useful range of bye-products adapted for land cultivation and other purposes. The principal display was that of sulphate of ammonia, which is the richest nitrogenous fertilizer on the market, and at its present price is cheaper than any other artificial manure. Proof of the growing popularity of this fertilizer is the increased consumption every year. The quality of its manuring powers was demonstrated by samples of garden produce and fruit, &c., which had been grown by its aid. The Company supply sulphatie of ammonia in quantities from 7 lbs., which is sufficient for 300 sq. yds. of land, up to any quantity required.

In addition the Company showed other products such as coke, graded in four sizes suitable for domestic and industrial purposes. Tins of prepared tar were on view, and attendants explained the adaptability of this tar for making roads and garden paths, and as a preservative when applied to wood and iron.

METROPOLITAN GAS COMPANY OF MELBOURNE.

The Ninety-Fifth Half-Yearly Meeting of the Company was held on July 28, at Melbourne—Sir JOHN GRICE (Chairman of Directors) presiding.

The CHAIRMAN, moving the adoption of the report and accounts for the half-year ended June 30, said that the revenue from the sales of gas—£619,598—showed a decrease of £53,876 in comparison with the corresponding period of 1924. This was principally due to the fact that the price was appreciably lower—namely, 6s. 8d., as against an average of 7s. 2d. per 1000 c.ft. for the first six months of 1924. From residuals the receipts were £135,182—an increase of £416 in comparison with the corresponding half of 1924. While the demand for coke and tar had been more than maintained, overseas requirements for sulphate of ammonia had again been limited, though the Australian demand was growing. The profits amounted to £110,181, from which sum transfers of £20,000 had been made to the reserve fund, and £5000 to the staff superannuation fund, leaving (after payment of the dividend of £82,500) a balance of £2681 to be added to the carry-forward, bringing this amount to £74,460.

Good business had again been done by the Stove and Fittings Department, notwithstanding the state of depression existing in the building and engineering trades. Owing to the resignation last year of the Company's Assistant Engineer, Mr. J. H. Grice, the Directors had appointed Mr. C. F. Broadhead, formerly Engineer of the Brisbane Gas Company, to the vacant position.

At the West Melbourne Works, the reconstruction of the first unit of the continuous vertical carbonizing plant, of which four installations were now in commission, had been completed, and this plant was now in successful operation. The construction of No. 5 was proceeding, and preparations were being made for its erection. During the half-year, 15¼ miles of mains had been laid. Nearly 43 miles of consumers' services had also been laid. Since the close of the half-year, additional capital being required for extensions, the Directors decided to offer for sale debentures to the amount of £143,000 at £98 10s. per £100 at 6 p.ct. for six years from Jan. 1, 1926. The amount mentioned (which was the balance that could be issued without disposal of further shares) was made available to the public on July 14, and that the issue proved attractive was shown by the fact that nearly £700,000 was sought immediately by applicants, rendering it necessary to refuse further applications.

The motion for the adoption of the report and balance-sheet was agreed to.

Mr. L. EVANS moved that a dividend of 7s. 6d. per share be declared for the half-year.

Mr. W. E. STEVENSON seconded the motion, which was agreed to.

Welshpool Lighting and Power Company.—At the annual meeting of the Company (formerly the Welshpool Gas Company) the Earl of Powis, Chairman, said that the increase in the consumption of gas was the largest in any year in the history of the Company. The recommendation to declare a dividend of 6 p.ct. was carried.

AUSTRALIAN GAS LIGHT COMPANY.

The Annual General Meeting of the Company was held on Aug. 13—Mr. GEORGE J. COHEN, Chairman of Directors, presiding.

The CHAIRMAN, in moving the adoption of the report, said that the past year had witnessed considerable development in the use of gas in Sydney, necessitating carefully planned extensions of the Company's plant in the works and on the district. The extensions carried out in the works comprised vertical retorts, condensers, exhausters, scrubbers, purifiers, and station meters. The large installation of vertical retorts, the erection of which was commenced some three years ago, had now been completed, and was working satisfactorily. This installation was the largest of its kind south of the Line, and was capable of producing 10 million c.ft. of gas per diem. Large extensions of the Company's system of distributing mains had been made in the past year, resulting in the connecting of 11,428 additional customers. The number of consumers now totalled 201,057. This was a very satisfactory figure when it was considered that the Company served an area with an approximate population of 800,000, so that one person in four was an actual customer.

INDUSTRIAL GAS DEPARTMENT.

In the last report reference had been made to a scheme for fostering the use of gas in industries. This scheme had since been put into operation, with excellent results, as was evidenced by the fact that the quantity of gas used for industrial purposes during the past year exceeded the quantity used during the previous year by 17½ p.ct. Close attention was being given to this valuable field for the use of gas. A well-equipped experiment and demonstration hall for the use of manufacturers had been provided, and every service, both technical and practical, was being afforded existing and prospective customers. Already over 70 trades were represented on the books of the Industrial Gas Department, and new fields had been opened up for their fuel, particularly in the paint and varnish, brassfounding, printing, and metal-working trades, as well as in the manufacture of foodstuffs. In addition to extending the use of gas in industry, the Company had increased their sales of fuel oil by over 100,000 gallons.

HOME SERVICE.

A Department of the Company's operations which was becoming of ever-increasing value to the community was that of Home Service, which was run in conjunction with the showroom activities. Lectures in cookery, the care of the cooker, and household hints were given daily at Head Office, and tri-weekly at the branches; evening classes also being held for the benefit of the staffs of various business houses. A popular innovation had been tri-weekly broadcast lectures. Evidence of the interest which the service was arousing was given by the hundreds of letters received from women in all parts of the country, asking for help in their household affairs. This was freely given, and in this way an excellent spirit of goodwill was fostered between the Company and the public. Women demonstrators visited customers' homes to give advice and instruction in the use and care of cookers. During the year a highly successful sale of gas appliances was conducted.

INCREASE IN GAS SALES.

A further increase of 238 million c.ft. in the gas sold brought the total quantity disposed of during the year to 6138 million c.ft. The revenue from gas sales amounted to £1,618,279, as against £1,565,246 last year—an increase of £53,033, despite the fact that a reduction in price of 2d. per 1000 c.ft. was made on Feb. 1, bringing the price to 5s. 2d. per 1000 c.ft.

On Feb. 1, the "B" debentures, amounting to £744,200, matured, and it was decided to issue new "1930" 7 p.ct. debentures amounting to £950,000, to redeem those and also to make provision for extensions to plant and property. During the year, the capital of the Company was increased by the submission to auction of 30,000 additional "A" shares, which were all disposed of at satisfactory prices.

DIVIDENDS.

The Directors recommended the payment of a dividend for the past half-year at the rate of 4 p.ct. on the old "A" and "B" shares, and in proportion on the new "A" shares; and this was agreed to. This will leave a balance of £29,053 to be carried forward.

THE MACLAURIN PLANT AT GLASGOW.

Inspection by the Gas Committee.

On Monday last week, the Glasgow Corporation Gas Committee made an official inspection of the Maclaurin plant installed at Dalmarnock Gas-Works. The installation consists of a battery of five units; each being capable of carbonizing 20 tons of coal per 24 hours. The plant has been running for some time experimentally; and the inspection enabled the members of the Gas Committee and other Councillors interested in the problem of smoke abatement to see what can be done. The question as to what the Corporation may do in connection with the future utilization of the plant will (the "Glasgow Herald" says) come up for consideration shortly. Among those present at the inspection were Mr. Councillor Renfrew, Convener of the Gas Committee; Mr. R. Maclaurin, the inventor of the process; and Mr. J. W. M'Lusky, General Manager of the Gas Department. Mr. Maclaurin explained to the Committee the principal features of the process. After inspecting the main installation, they were shown how the gas produced by the plant can be used to raise steam, heat retorts, and drive locomotives. They also inspected bulk samples of the smokeless fuel, which is now available for distribution to the public.

The plant was erected by Messrs. Blair, Campbell, & M'Lean, of Govan. The height from the charging hoppers to the discharging shoots is 36 ft., and the internal width at the widest point is 8 ft., tapering upwards and downwards. Where the air enters, a centre wall divides the plant into two equal-sized chambers. The air has admission through ports in the centre wall and also in the side walls

opposite. The coke after cooling is discharged through shoots at the bottom. The coal preferred is of the low coking variety. The wagons are emptied by a rotary wagon tippler on to a grid, where any large pieces are broken by hand. From this the coal passes to the boot of an elevator; and by this it is conveyed to the coal bunkers above the plant, which hold 200 tons. After the producer is fully charged, it takes 20 hours to raise the coal to the desired coking temperature, which is a little above 700° C. The coal drops about a foot and rises in temperature about 35° C. per hour. This gradual increase in temperature modifies the nature of the coke.

The quantity of gas made per ton of coal regulates the type of coke made. Black smokeless fuel is produced with a make of gas between 25,000 and 30,000 c.ft., and the grey type when the gas yields are above 30,000 c.ft. per ton. From the Scotch coals tested, containing from 6 to 10 p.ct. of moisture, and from 30 to 35 p.ct. of volatile matter, about 55 p.ct. of smokeless fuel has been obtained. Before withdrawing the coke, it has to be cooled, and for this purpose steam is blown in at the discharging shoots. The steam first cools the coke and is then itself decomposed into water gas as it approaches the combustion zone. The calorific value of the water gas is about 300 B.Th.U. Producer gas is made in the combustion zone. This hot producer gas, passing up, supplies all the heat necessary for carbonization. This gas has a value of 150 B.Th.U. or thereabouts. Above the combustion zone is one where the fuel is between 750° C. and 500° C., and here some ammonia is generated. Above this zone the coal is giving-off oil and gas, and this is termed the distillation zone. In the upper regions oils are given off, and pass upwards through the fuel at gradually decreasing temperatures. Little decomposition therefore takes place, and instead of a benzenoid coal tar a highly phenolic crude oil is obtained. The cooled coke drops into a trolley running below the plant, and is afterwards screened and prepared for use. The proportion of smokeless fuel produced per ton of coal carbonized varies with the kind of coal used.

The Committee afterwards visited the Tradeston Gas-Works and inspected an installation of horizontal retorts to carbonize 240 tons of coal per day.

CHESTERFIELD GAS UNDERTAKING.

In his annual report for the year ended March 31, Mr. H. Davies, the Engineer and Manager, states that the gas sold, as registered by consumers' meters, shows an increase of 37,326,000 c.ft., or 11·6 p.ct., of which 56 p.ct. is attributable to prepayment meters, and 44 p.ct. to ordinary meters and public lamps. The price of gas was reduced on Jan. 1, 1924, by the substantial discount of 12½ p.ct.; and the year's balance-sheet has had to carry this reduction of income, in addition to the reduction which was made in the December quarter of 1923. This would have been accomplished but for the heavy slump in residuals, particularly towards the close of the year. The reduction in public lighting charges also reduced the revenue by over £1000. The gross profit was £12,914, and the net loss £4783. During the year six beds of ten retorts each, on the horizontal principle, have been installed, complete with coal and coke handling machinery, and retort charger and discharger. New condensers, exhauster, washer, and scrubbers have also been erected, but not connected or completed for use.

Wenham Lighting Corporation.

Trading as the Wenham Lighting Corporation, William Reginald Grigsby attended in the London Bankruptcy Court on Tuesday, Sept. 15, for his public examination on a statement of affairs showing ranking liabilities £2577, and assets £909. Replying to Mr. Wheeler (Assistant Official Receiver), the debtor stated that for many years prior to August, 1911, he was in employment. He then purchased, and subsequently continued, his father's business of gas lamp manufacturer, carried on at No. 184, Gray's Inn Road, W.C., under the style of the Wenham Lighting Corporation. After the armistice he also became a factor of electrical goods, and during 1924 sustained a heavy loss on electrical goods in connection with some contracts at the Wembley Exhibition. He attributed his failure to lack of capital, to bad debts, and to depreciation in value of stock. The examination was concluded.

Extensions at Dunbar.—In order to meet the growing needs of Dunbar as a watering place, the Town Council have adopted a report by Mr. James Jamieson, of the Edinburgh Corporation Gas Department, for the development and extension of the gas-works. A new carburetted water gas plant and other apparatus are to be installed at a cost of £5600, and the works are to be so laid out and constructed as to be capable of future development.

British Industries Fair, 1926.—The Seventh British Industries Fair, Birmingham, will take place from Feb. 15 to 26, 1926, and will again be housed in the permanent exhibition buildings at Castle Bromwich. The Fair will run concurrently with the London Section, and immediately prior to the Leipzic Fair, so as to enable overseas buyers to visit this country on their way to the Continental Fair. The Birmingham Chamber of Commerce Information Bureau will give any information to visitors relative to the industries of the district and of the country.

Alliance and Dublin Consumers' Gas Company.—The report of the Directors for the half-year ended June 30 shows a profit on the revenue account of £63,245. After providing for interest on debenture stock and temporary loans, and depreciation on investments on general account, there remains the sum of £55,113, to which are added £3296, being the balance brought from the last account, and a credit from income-tax amounting to £87—making a total of £58,498. [The Directors recommend the declaration of the maximum statutory dividend on the consolidated ordinary stock of the Company, at the rate of £6 5s. p.ct. per annum, less income-tax. This will absorb £48,495, after which a balance of £10,002 will remain to be carried to the next account.]

CONTINENTAL UNION GAS COMPANY, LTD.

On Tuesday next, Sept. 29, the Directors will submit their report for the year ended June 30. This states that the gas industry in France continues to show improvement. The Compagnie l'Union des Gaz have again been able to increase their dividends, this time from 5 to 7½ p.ct., in spite of the fact that the selling price of residuals has fallen during the year. From a purely revenue point of view, therefore, this improvement enables the directors to recommend the resumption of dividend payments on the ordinary stock, which have been in abeyance since 1915. It has, the report goes on to say, to be remembered that the inflation, which it was difficult for France to avoid, has inevitably reduced the purchasing power of the franc, and consequently the sterling value of the Company's Continental investments. These investments represent Gas Company share holdings in French currency acquired a long time ago, and are now much below their former exchange value. Until the franc has been stabilized, it is impossible to make a reliable valuation of these investments. In the meantime it is desirable to remember that some day a heavy depreciation may have to be dealt with. Until this is done, it would be imprudent to divide the whole of the Company's revenue, and the policy of beginning to build up an exchange reserve, introduced three years ago, should be continued.

After deducting management expenses and pensions charges, and making provision for income-tax, the balance at the credit of profit and loss account at the close of the year, including £2040 brought forward, is £31,744. In view of the policy outlined above, the Directors have transferred £6000 to the exchange reserve account, leaving £25,744 to be dealt with. An interim dividend of 3½ p.ct., less income-tax, has been paid on the preference stock; and the Directors now recommend the payment of a final dividend on the same stock of the same amount, making 7 p.ct. for the year, less tax. They also recommend a distribution of 2 p.ct., less tax at 4s. 4½d. in the pound, on the ordinary stock. This will leave a balance to be carried forward of £2306.

CURRENT SALES OF GAS PRODUCTS

The London Market for Tar, Tar Products, and Sulphate.

LONDON *Sept.* 21.

There appears to be a fair amount of business doing in pitch, and the price remains steady between 40s. and 42s. 6d. per ton. The shipping season has commenced, and buyers seem eager to get early delivery. Exports of pitch for July-August this year amounted to 12,500 tons, against about 2000 tons over the same two months of last year.

Creosote remains steady at about 6⅞d. net per gallon f.o.b.; but there is not much inquiry at the moment.

Anthracene is unsaleable, as dye-makers seem to be very well stocked and present prices do not pay the tar producer to extract the material.

Tar Products in the Provinces.

Sept. 21.

There is little doing in tar products generally, although a fair amount of business is reported to have been done on the Continent in pitch for delivery to the end of the year, at prices round about 38s. per ton f.o.b., and it would appear that the market, on this side at any rate, is a little steadier than has been the case for some time past.

Cresote remains steady, and there continues to be more inquiry both from home and foreign buyers. There is little alteration in the market for water-white products, although solvent naphtha is not so much sought after as was the case a few weeks ago, the reason being probably that rubber manufacturers have covered their immediate requirements and are waiting to see if there is any alteration in price before booking any further quantity.

There is still nothing of interest to mention with regard to carbolic, cresylic, or naphthalene.

The average values for gas-works products during last week were: Gas-works coal-tar, 25s. to 30s. Pitch, East Coast, 37s. 6d. to 38s. 6d. f.o.b. West Coast—Manchester, 32s. 6d. to 33s. 6d.; Liverpool, 33s. 6d. to 34s. 6d. Clyde, 32s. 6d. to 37s. 6d. Benzole, 90 p.ct., North, 1s. 7½d. to 1s. 8½d.; crude, 65 p.ct., at 120° C., 1s. to 1s. 1d., naked at makers' works; 50-90 p.ct., naked, North, 1s. 7½d. to 1s. 8½d. Toluole, naked, North, 1s. 6½d. to 1s. 7½d., nominal. Coal-tar crude naphtha, in bulk, North, 7½d. to 8½d. Solvent naphtha, naked, North, 1s. 4½d. to 1s. 6d. Heavy naphtha, North, 1s. to 1s. 2d. Creosote, in bulk, North, liquid, 5⅝d. to 5¾d.; salty, 5¾d. to 5¾d.; Scotland, 5⅝d. to 5⅝d. Heavy oils, in bulk, North, 6½d. to 6¾d. Carbolic acid, 1s. 4d. to 1s. 5d. prompt. Naphthalene, £11 to £14; salts, £4 to £5, bags included. Anthracene, "A" quality, 2½d. per minimum 40 p.ct., purely nominal; "B" quality unsaleable.

Exhibition at Workington.—An exhibition of gas apparatus was opened at the Drill Hall, Edkin Street, Workington, on Tuesday, Sept. 22. This event, which has been organized by the Borough of Workington Gas Department, is fully in keeping with the progressive policy of this undertaking. The display is skilfully arranged, and visitors are rewarded with a comprehensive idea of the progress made in the manufacture of gas equipment for lighting, cooking, heating, and water heating. Conspicuous on the stand are Richmond's "Bungalow" and "Ranelagh" cookers. There is also (among other "Richmond" apparatus) an excellent display of their "Standard" series of fires in black and "lustre" finish, in which the "Marlborough" design is given prominence. Workington is to be congratulated on this effort, which will undoubtedly make for more business.

NORTH-EAST COAST COAL TRADE.

From our Own Correspondent.

The past week has done a little to encourage those who were of opinion that the worst has been seen in this market. As usual, it is the better classes of coal which have benefited first; but the increased inquiry of the last week or two, and the few orders which have resulted from it, have given a firmer tone. The better-class producers in some instances have full books for several weeks ahead, and quotations are consequently inclined to harden.

The nature of some of the inquiry is also satisfactory, as showing that we are once again a serious competitive factor in Continental markets. For example, gas coal has been sold for delivery to Berlin over a period which runs well into next year.

The better qualities of steam coals are well stemmed for the next few weeks, and prices are firmly held. Wear Special gas makes quote 16s. 6d. to 17s., and best qualities are about 16s. 6d. Both are in fair demand and steady. Seconds, however, are plentiful, and obtainable at 13s. to 13s. 6d. Durham coking is the dullest spot in the market, and there appears to be no demand at all, though several inquiries lately would seem to suggest that the low prices indicated may be attracting attention.

COAL TRADE IN THE MIDLANDS.

From our Local Correspondent.

The outlook remains exceedingly gloomy. In no direction is there any movement to brighten the prospect. Gas undertakings are for the most part bent upon getting stocks down, notwithstanding the advance of the season. Retardation of deliveries is causing a good deal of inconvenience. There is little increase of consumption to assist in restoring equilibrium. Contractors say they can discern no broadening of activity so far as industrial fuel is concerned. Prices suffer, of course, as slack and smalls accumulate. Reactions can be felt in some other branches of the market. But on the whole price stability is wonderfully maintained. While collieries are anxious to secure a good turnover, they are more anxious not to overburden the market. When the turn of the tide comes, they want to be in a position to use it to extricate the trade from the unprofitable conditions in which it has been carried on of late.

Unable to sell their coke, and having no room to stack more, many of the gas engineers are resorting to water gas. Some of these aberrations will no doubt be corrected by the colder and darker days that are at hand; but meanwhile employment at the pits is very irregular. Blast-furnace coke is abundant at about 13s. a ton at ovens.

YORKSHIRE AND LANCASHIRE COAL TRADE.

From our Local Correspondent.

The cooler weather has made house coals in Yorkshire and Lancashire in better request; but, owing to the industrial situation, collieries are not yet able to work full time. There is some improvement on the export side, with inquiries from Germany, but values all round are low.

Gas coals move slowly under contract, with indications of slightly decreased prices from those booked under contract some months back.

Humber bunker and export prices (nominal) f.o.b. usual shipping ports at the week-end were: South Yorkshire—Hards, Association, 18s. 9d.; screened gas coal, 17s. 6d.; washed trebles, 18s.; washed doubles, 18s.; washed singles, 15s. 9d. to 16s.; washed smalls, 12s. 6d.; unwashed doubles, 14s. 6d. to 15s.; rough slack, 10s. to 10s. 3d.; smithy peas, 17s. 6d. to 19s. 6d. West Yorkshire—Hartleys, 16s. 6d.; screened gas coal, 16s. 6d. to 17s.; washed trebles, 17s.; washed doubles, 15s. 6d.; washed singles, 14s. 6d.; washed smalls, 12s.; unwashed trebles, 15s. 6d.; unwashed doubles, 12s.; rough slack, 10s. 6d.; coking smalls, 10s. Derbyshire and Notts—Top hards, 18s. 9d. to 20s. 6d.; washed trebles, 17s. 6d.; washed doubles, 16s. 6d. to 17s.; washed singles, 15s. 6d. to 16s.; washed smalls, 11s. 3d. to 12s.; unwashed doubles, 13s. 6d. to 14s.; rough slack, 9s. 6d. to 10s. Yorkshire, Derbyshire, and Nottinghamshire—Screened steam coal, 14s. 9d. to 17s. 3d.; gas coke, 18s. to 23s.; furnace coke, 17s. 6d. to 18s. 6d. per ton.

CONTRACTS OPEN.

Boosting Plant.

The Magistrates and Council of the Edinburgh Corporation are prepared to receive tenders for the supply, delivery, fixing, &c., of a boosting plant at their Granton Gas-Works. [See advert. on p. 762.]

TRADE NOTES.

A New Welsbach Catalogue.

In their 1925-26 general catalogue, the Welsbach Light Company, Ltd., have detailed the addition of new patterns to the comprehensive range contained in their catalogue for last season. The "Eddystone" burner, for example, will in future be fitted with an all-magnesia nozzle and mixing chamber combined, which increases the candle-power and is non-corrosive. A new type of factory burner with cast-iron superheater chamber for two or three bijou size mantles is another introduction for the present season. Altogether the new list maintains the high standard which one has learned to expect in the productions of the Welsbach Company.

Hathersage Gas Company.—In their annual report the Company state that the profit for the past year amounted to £2250. The Directors recommend a final dividend of 5½ p.ct. for the half-year, making 9 p.ct. for the year.

Dorking Gas Company.—The accounts for the half-year ended June 30 show, after providing for interest on debenture stock, a balance available for dividends of £3189; and the Directors recommend the payment of dividends at the rate of 10 p.ct. per annum on the "A" and "B" shares, 7 p.ct. on the 'C" shares, and 5 p.ct. on the "D" shares. This will absorb £1775, and leave a balance of £1414 to be carried forward to the next account. The gas sold for the half-year shows an increase of nearly 10¼ p.ct. over the corresponding period of last year.

Walsall Gas Prices.—The Gas Committee of the Walsall Town Council have decided that after the September readings of the meters the following reductions in the price of gas shall take place: For gas used by industrial consumers, up to 100,000 c.ft. per quarter, from 9d. to 8d. per therm; over 100,000 and up to 150,000 c.ft., from 8¾d. to 7¾d.; over 150,000 and up to 200,000 c.ft., from 8¼d. to 7¼d.; over 200,000 and up to 300,000 c.ft., from 8d. to 7d.; and the price for consumption over 300,000 c.ft. will be 6d. per therm.

Deal and Walmer Gas Company.—In their report for the year ended June 30, the Directors draw attention to the rapid increase in the Company's business. In the financial year covered by the report the amount of gas sold was 104 p.ct. more than in the year ended June 30, 1919. In other words, the sale of gas has more than doubled in six years. This rapid increase necessitates further enlargement of plant and mains. To meet the necessary expenditure and to pay-off bank overdraft, a resolution was passed at an extraordinary general meeting held on June 24, authorizing the Directors to issue capital up to the amount of £25,000. It is intended to make an issue of capital this autumn by public tender. The Directors recommend a dividend of 7½ p.ct. per annum for the last half-year—the same as the interim dividend paid in March last.

Experimental Street Lighting at Bradford.—A special Joint Sub-Committee of the Bradford Corporation Gas and Electricity Committees met last week to consider reports presented by the Gas Engineer (Mr. Charles Wood) and the Electrical Engineer (Mr. T. Roles) conveying suggestions for improved public lighting on main highways. The meeting adjourned to give the members time to digest the reports thoroughly. Meantime, Manningham Lane is the selected road for the tests. It is the main artery into Airedale, and probably carries more traffic than any other road in Bradford. The three systems to be tested are (1) the existing gas lighting by three upright mantles per lamp; (2) gas lighting by six inverted mantles; and (3) electric arc lighting. A stretch of the new gas lighting has already been installed beyond Lister Park gates, and is a decided improvement.

Application is to be made to the Ministry of Health for sanction to a loan of £9943 for meters 10r the Blackpool Gas-Works.

The Hartlepool Gas and Water Company announce an increase in the price of gas of 2·55d. per 1000 c.ft. for this month's meter readings.

In January next an exhibition of industrial heating and domestic and industrial cooking appliances is to be held in the town by the Walsall Corporation Gas Committee.

The Lighting Committee of Pershore have accepted the tender of the Pershore Gas Company for the lighting of the street lamps from Oct. 1 till March 31 at £2 10s. per lamp.

The concluding day of a shopping week at Otley included a street procession, in which the Otley Gas Company won the second prize in the competition for the best tradesmen's exhibit.

The Lighting Inspectors of the Eccleshall District have accorded a vote of thanks to the Eccleshall Gas Company for the efficient way in which the streets in the district were lighted.

It has been decided to raise the price of gas from 1s. to 1s. 1d. per therm within the Urban District of Poulton-le-Fylde, and from 1s. to 1s. 1⅜d. per therm in the surrounding parishes.

By invitation of Mr. J. G. Winstanley, Engineer and Manager of the Wolverhampton Gas Company, members of the Wolverhampton Rotary Club recently visited the works of the Company.

The Driffield Urban District Council have received sanction from the Ministry of Health to borrow £1000 for the provision of gas meters, cooking stoves, and other appliances in connection with the local gas undertaking.

The Ballymena Urban Council have resolved, on the recommendation of the Gas Control Committee, to reduce the price of gas to 6s. 8d. per 1000 c.ft. for lighting, and 6s. 3d. for heating, subject to the usual discounts.

The Hebden Bridge and Mytholmroyd Gas Board are considering the advisability of approaching the Hebden Bridge District Council with a view to the two bodies having joint premises on the Garden Square site, which, so far as the Gas Board are concerned, would be used as offices, workshops, and showrooms.

By the end of the year the village of Milton of Campsie is likely to be without a gas supply, intimation having been received from the Calico Printers' Association, who have been supplying gas from the Lilyburn Works, that they are ceasing to manufacture it. An attempt was made to get Kirkintilloch Town Council to extend their supply to the village, but the Council did not see their way to accede to the request.

At the close of the recent exhibition of gas appliances arranged by the Elland-cum-Greetland Gas Company, Mr. J. Bridge, the Engineer and Manager, stated that arrangements had been made for the whole of the cakes made in the schoolgirls' and open cake-making competitions to be sent to the Halifax Royal Infirmary. In the open cake competition, in which there were 39 competitors, the first prize was a gas fire, and the second prize a gas iron.

STOCK MARKET REPORT.

THE conditions on the Stock Exchange last week were similar to those of the few preceding weeks. With the incidence of trade depression and the consequent plenitude of money, it would seem that the Bank Rate might well be reduced to 4 p.ct. This would be welcomed by the business community, although it is unusual at this time of the year. Gilt-edged securities alone received any material support. The 5 p.ct. War Loan rose to 102½, Funding Loan touched 89⅞, and Victory Bonds 93¼, and there were rumours of a fresh Conversion Loan operation. Little business was done in the Foreign Market.

The Industrial Market was very slack. With the exception of Courtaulds and Bradford Dyers, which rose 6⅛ and 9os. respectively, there is little to record.

An announcement of interest to gas investors is the resumption of dividend payments by the Continental Union Gas Company. It is proposed to pay a dividend on the ordinary capital of 2 p.ct. (the first since 1914). The increase in the balance of profit available is very satisfactory: June, 1923, £14,836; June, 1924, £18,891; June, 1925, £31,744. The only important changes in the quotations were a fall of 7 points to 105-110 in the Tottenham and District "A" stock, and a rise of 1s. in the Primitiva ordinary.

The following transactions were recorded during the week:

On Monday, Alliance and Dublin 65⅜, Cape Town and District 7, Gas Light and Coke 80⅛, 81, 3½ p.ct. max. 60¼, 3 p.ct. deb. 61, Hastings and St. Leonards 3½ p.ct. converted 74 *ex* div., Imperial Continental 149½, 150½, Montevideo Gas and Dry Dock 69, Plymouth and Stonehouse 5 p.ct. 111½, Primitiva 9s. 7½d., 9s. 10½d., 10s., 10s. 1½d., South Metropolitan 91, 91¼, 6½ p.ct. deb. 101¼ *ex* div., South Suburban 5 p.ct. 93½, 93¾. Supplementary prices, Cambridge University and Town 5 p.ct. perp. deb. (fully paid) 95⅜, 95½, Southend-on-Sea 5 p.ct. "B" 80½.

On Tuesday, Alliance and Dublin 65½, 4 p.ct. deb. 63, Commercial 3 p.ct. deb. 57½, 58, European 7 7/16, Gas Light and Coke 80, 80⅛, 80¼, 4 p.ct. cons. pref. 77½, 78½, Montevideo 68, 68⅛, Primitiva 10s., 10s. 1½d., South Metropolitan 91⅛, 6½ p.ct. deb. 101¼, South Suburban 5 p.ct. 95⅛, 95½, Tottenham District 3½ p.ct. "B" cons. 86. Supplementary prices, Cambridge University and Town 5 p.ct. perp. deb. (fully paid) 95⅜, Liverpool 5 p.ct. 82¼, Southend-on-Sea 5 p.ct. "B" 81.

On Wednesday, Bournemouth 6 p.ct. pref. 11 1/16, Brentford 4 p.ct. perp. deb. 78½, Continental Union 38½, Gas Light and Coke 80, 80⅛, 80⅜, 80⅛, 3½ p.ct. max. 60, 4 p.ct. cons. pref. 77, 78, Imperial Continental 149, Montevideo 68, 68½, Primitiva 10s., 10s. 1½d., 10s. 3d., South Metropolitan 91, 91½, 92, 3 p.ct. perp. deb. 58⅜, 6½ p.ct. red. deb. 101½, 102½ *ex* div., Tottenham "B" cons. 87.

On Thursday, Aldershot 4 p.ct. cons. pref. 70, Alliance and Dublin 66⅞, Continental Union 38½, Gas Light and Coke 80, 80⅜, 80⅛, 3½ p.ct. max. 60⅜, 3 p.ct. cons. deb. irred. 60, 61, Imperial Continental 149, 3½ p.ct. deb. 71, Primitiva 10s., 10s. 1½d., 10s. 3d., 10s. 4½d., South Metropolitan 91, 91½, 91⅜, 92, 6½ p.ct. deb. 102½ *ex* div., Tottenham District "B" cons. 87. Supplementary prices, Liverpool 5 p.ct. 81¾, 82¼.

On Friday, Bombay 18s. 0d., Brentford "B" cons. 93, 94½, British Gas Light 107½, 108½, Commercial 4 p.ct. 79, 3½ p.ct. 79, 3 p.ct. perp. deb. 57, Continental Union 37½, Croydon, sliding-scale stock, 100, Gas Light and Coke 80, 80⅛, 80⅜, 3½ p.ct. max. 60, 60⅛, 4 p.ct. cons. pref. 78, 3 p.ct. cons. deb. 61, Imperial Continental 149, 150½, Lea Bridge District 96, 96½, Liverpool 7 p.ct. pref. 105, Malta and Mediterranean 85s., 87s. 6d., Oriental 103, Primitiva 10s., 10s. 1½d., 10s. 3d., 10s. 4½d., 10s. 6d., South Metropolitan 91⅛, 91½, 91⅜, 92, 6½ p.ct. deb. 102½ *ex* div., Tottenham District "A" cons. 105, "B" cons. 85. Supplementary prices, Brighton and Hove 5 p.ct. perp. deb. 96½, British (Norwich) 3½ p.ct. mt. debs. 63½, Liverpool 5 p.ct. 82½, Malta and Mediterranean 1st (7 p.ct. pref.) 95s., 97s. 6d., Southend-on-Sea 5 p.ct. 84½, 85.

The weakness of the discount quotations in the Money Market was accentuated by the unexpectedly low rate at which the Treasury Bills were allotted—the average rate being £3 10s. 1·05d. p.ct. The margin now is even wider than was the case when the reduction took place in the official minimum on Aug. 6. The market was also surprised that after a lapse of nine months an allotment was made of 4 p.ct. Treasury Bonds, although it consisted of only £250,000 at £94 p.ct. In Lombard Street quotations fell to 2 p.ct. quite early in the day for fresh overnight money.

In the Foreign Exchange Market the recovery in the Belgian franc made further progress—as a result, it is believed, of official support, closing 45 centimes down at 110.10. French francs also improved in value, and closed at 102.50. Italian lire came on offer again, and the price advanced to 118⅜. Sterling on New York was easier at 4.84 11/16.

Silver, in the absence of Indian inquiries, declined 1/16d. to 32 5/8d. per oz. Gold was nominally unaltered at 84s. 11½d. per oz.

The Bank Rate is 4½ p.ct., to which it was reduced from 5 p.ct. on Aug. 6. Bankers' deposit rates are 2½ p.ct. The deposit rates of the discount houses are 2½ p.ct. at call and 2¾ p.ct. at notice.

Issue.	Share.	When ex-Dividend.	Dividends. Prev. Hf.Yr.	Dividends. Last Hf. Yr.	NAME.	Quotations. Sept. 18.	Rise + or Fall − on Week.	Transactions Lowest and Highest Prices.
£			% p.a.	% p.a.				
171,978	Stk.	Aug. 13	5	5	Aldershot 5 p.c. max. C.	75—78	..	..
295,492	"	"	4	4	Do. 4 p.c. Pref.	69—74	..	70
1,551,868	"	Apl. 2	6½	6½	Alliance & Dublin Ord.	63—68	..	65½—66⅞
374,000	"	July 9	4	4	Do. 4 p.c. Deb.	60—65	..	63
300,000	1	May 7	1/7⅞	1/7⅞	Bombay, Ltd.	⅞—1	..	18/9
170,000	10	Aug. 13	8½	8½	Bournemouth 5 p.c.	12—13	..	..
425,050	10	"	7	7	Do. B 7 p.c.	12—12½	..	..
150,000	10	"	6	6	Do. Pref. 6 p.c.	11—12	..	11 11/16
50,000	Stk.	June 25	3	3	Do. 3 p.c. Deb.	56—59	..	..
162,025	"	"	4	4	Do. 4 p.c. Deb.	77—80	..	..
992,045	"	July 9	6 5/16	6 5/16	Brentford A Con.	93—98	..	..
990,500	"	"	6¾	6¾	Do. B New	93—98	..	93—94½
76,000	"	"	5	5	Do. 5 p.c. Pref.	94—97	..	..
306,690	"	June 11	4	4	Do. 4 p.c. Deb.	75—80	..	78½
181,337	"	"	6	6	Do. 6 p.c. Rich. Red. Deb.	100—105	..	..
214,740	"	Aug. 27	12½	12	Brighton & Hove Orig.	161—166	..	..
244,200	"	"	9½	9	Do. A Ord.	119—122	..	..
1,287,500	"	July 23	5	5	Bristol 5 p.c. max.	89—91*a*	..	..
855,000	"	Mar. 19	8	7	British Ord.	105—110	..	107—108½
100,000	"	June 25	7	7	Do. 7 p.c. Pref.	120—125	..	..
120,000	"	"	4	4	Do. 4 p.c. Red. Deb.	71—76	..	..
100,000	10	May 21	6	8	Cape Town, Ltd.	6¾—7½	..	7
100,000	10	Apl. 23	4½	4½	Do. 4½ p.c. Pref.	5¾—6¾	..	..
150,000	Stk.	June 25	4½	4½	Do. 4½ p.c. Deb.	69—74	..	..
626,860	"	July 23	6	6	Cardiff Con. Ord.	98—101	..	..
237,860	"	June 25	7½	7½	Do. 7½ p.c. Red. Deb.	101—104	..	..
157,150	"	Aug. 13	6¼	5	Chester 5 p.c. Ord.	90—95*b*	..	..
1,513,280	"	July 23	5/14/8	5⅜	Commercial 4 p.c. Cap.	78—83	..	79
560,000	"	"	5⅜	5/3/4	Do. 3½ p.c. Cap.	78—83	..	79
475,000	"	June 11	3	3	Do. 3 p.c. Deb.	56—59	..	57—58
800,000	"	14 Jan. 15	—	—	Continental Union, Ltd.	35—40	..	37⅛—38½
200,000	"	June 11	7	7	Do. 7 p.c. Pref.	88—91	..	..
660,000	"	Aug. 13	6½	6½	Croydon sliding scale	96—100	..	100
284,975	"	"	5	5	Do. max. div.	81—84	..	..
492,270	"	Aug. 13	9	6	Derby Con.	107—109*c*	..	..
55,000	"	June 25	4	4	Do. Deb.	74—76*c*	..	..
1,002,180	10	July 23	4	6	European, Ltd.	7—8	..	7 7/16
16,460,070	Stk	Aug. 13	5½	5½	Gas Light & Coke 4 p.c. Ord.	79—81	..	80—80½
2,600,000	"	"	3½	3½	Do. 3½ p.c. max.	60—63	..	60—60½
4,062,235	"	"	4	4	Do. 4 p.c. Con. Pref.	77—80	..	77—78½
4,761,930	"	June 11	3	3	Do. 3 p.c. Con. Deb.	58—61	..	60—61
130,000	"	—	10	10	Do. 10 p.c. Bonds	..	..	..
42,000	"	—	7½	7½	Do. 7½ p.c. Ilford Deb.	..	..	..
82,500	"	Mar. 19	6½	6½	Hastings & St. L. 5 p.c. Conv.	90—95*	..	..
258,740	"	"	5½	5½	Do. 3½ p.c. Conv.	71—76*	..	74
70,000	10	May 7	10	10	Hongkong & China, Ltd.	17½—18	..	..
86,600	Stk.	Aug. 13	10	10	Hornsey 7 p.c.	132—137	..	..
1,976,000	"	May 21	10	59	Imperial Continental Cap.	148—15[illegible]	..	149—15[illegible]½
226,170	"	Aug. 13	3½	3½	Do. 3½ p.c. Red. Deb.	70—73	..	71
235,242	"	Aug. 13	6½	6½	Lea Bridge 5 p.c. Ord.	94—99	..	96—96½
2,127,340	"	Aug. 13	5½	5½	Liverpool 5 p.c. Ord.	82½—83*b*	..	82½
600,000	"	Mar. 19	7	7	Do. 7 p.c. Red. Pref.	104—106*b*	..	105
165,736	"	Aug. 27	8	9	Maidstone 5 p.c. Cap.	118—128	..	..
63,480	"	June 25	3	3	Do. 3 p.c. Deb.	55—60	..	..
75,000	5	June 25	3	7	Malta & Mediterranean	4—4½	..	85/0—87/6
541,920	Stk.	June 11	4	4	Montevideo, Ltd.	65—69	..	68—69
2,061,315	"	Aug. 13	5	5	Newcastle & Gateshead Con.	71—72*d*	..	..
300,929	"	"	4	4	Do. 4 p.c. Pref.	75½—76½*d*	..	..
529,705	"	June 25	3½	3½	Do. 3½ p.c. Deb.	68—68½	+1½	..
15,000	"	Aug. 27	12	11½	North Middlesex 10 p.c.	—*	..	..
75,940	"	"	8⅛	8 5/16	Do. 7 p.c.	—*	..	..
300,000	Stk.	May 7	9	7	Oriental, Ltd.	100—105	..	103
188,120	"	June 25	7½	7½	Plym'th & Ston'house 5 p.c.	108—113	..	111½
60,000	50	Aug. 27	14	14	Portsea Island B	93—96	..	..
100,000	50	"	13	13	Do. C	90—95	..	..
2,289,909	1	—	—	—	Primitiva Ord.	9/9—10/9	+1/-	9/7½—10/6
302,600	100	June 2	4	4	Do. 4 p.c. Red. Deb.	78—80	..	..
600,000	Stk.	July 23	4	4	Do. 4 p.c. Red. Deb. 1911	62—64	..	..
193,744	"	June 25	4	4	Do. B. Aires 4 p.c. Rd. Db.	63—65	..	..
264,496	"	"	4	4	Do. R'r P'te 4 p.c. Rd. Db.	63—65	..	..
150,000	10	Mar. 19	6	6	San Paulo 6 p.c. Pref.	7½—8½	..	..
125,000	50	July 1	5	5	Do. 5 p.c. Red. Deb.	42—43	..	..
270,000	Stk.	Mar. 19	5½	5½	Sheffield A	101—102*a*	..	..
419,968	"	"	5½	5½	Do. B	101—102*a*	..	..
1,047,000	"	"	5½	5½	Do. C	101—102*a*	..	..
90,000	10	June 11	6	4	South African	7—9	..	..
6,609,895	Stk.	Aug. 13	6½	5	South Met. Ord.	90—92	..	91—92
1,895,445	"	July 9	3	3	Do. 3 p.c. Deb.	57—60	..	58½
734,000	"	Mar. 5	6½	6½	Do. 6½ p.c. Red. Deb.	101—103*	..	101½—102½
91,500	"	Aug. 13	8½	8½	South Shields Con.	132—133*d*	..	..
1,187,795	"	July 23	6½	6½	South Suburban Ord. 5 p.c.	92—97	..	93½—95½
368,837	"	June 25	5	5	Do. 5 p.c. Deb.	95—98	..	..
647,740	"	May 7	5	5	South'mpt'n Ord. 5 p.c. max.	80—83	..	..
121,275	"	June 25	4	4	Do. 4 p.c. Deb.	70—75	..	..
250,000	"	Aug. 27	7	7	Swansea 7 p.c. Red. Pref.	100—102	..	..
200,000	"	June 25	6½	6½	Do. 6½ p.c. Red. Deb.	101—103	..	..
120,000	"	July 23	8	7½	Tottenham District A 5 p.c.	105—110	−7	105
882,275	"	"	6½	5½	Do. B 3½ p.c.	85—90	..	85—87
150,000	"	July 9	—	28/4	Do. 5½ p.c. Pref.	103—105	..	..
181,255	"	June 11	4	4	Do. 4 p.c. Deb.	76—79	..	..
258,251	"	Mar. 19	5	5	Tynemouth Con. and New	72—74*d*	..	..
197,294	"	Aug. 27	6½	6½	Uxbridge, Maidenhead, & Wycombe 5 p.c.	93—98	..	..
88,330	"	"	5	5	Do. 5 p.c. pref.	93—98	..	..
91,800	"	"	6½	6½	Do. 5 p.c. Maidenh'd	88—93	..	..
					Wandsworth, Wimbledon, and Epsom—			
30,000	"	July 9	9½	8½	Wandsworth A 5 p.c.	125—130	..	..
855,636	"	"	7½	7	Do. B 3½ p.c.	107—112	..	..
392,955	"	"	6/9/6	5/19/0	Do. C and New	93—96	..	..
352,000	"	"	7⅜	6½	Wimbledon 5 p.c.	100—105	..	..
98,000	"	"	7⅜	7⅜	Epsom 5 p.c.	109—112	..	..
88,416	"	June 25	3	3	3 p.c. Deb.	56—59	..	..

Quotations at:—*a*,—Bristol, *b*,—Liverpool, *c*,—Nottingham, *d*,—Newcastle, *e*,—Sheffield, * Ex. div.